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SUMMARY OF RESEARCH PROJECTS

1969 - 1970

(Report #50)



Educational Testing Service

Princeton, New Jersey

September 1970

FOREWORD

The "Summary of Research Projects" reports on research carried on at ETS during the period July 1, 1969, through June 30, 1970.

Questions concerning the studies reported herein should be directed to the authors. If a report on a study is available, this will be indicated by a number appearing in the body of the write-up. When requesting a copy of a report please use this number.

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An Investigation of Student Test-Taking Behavior (65-1)

Miss Anderson
Mrs. Barron
Mr. Seibel

PURPOSE: The purpose of this study is three-fold: (1) to obtain information about student test-taking behavior, (2) to examine the relationships between teachers' evaluations and external observers' evaluations of this behavior, and (3) to see how test-taking behavior and the relationships between teacher and observer evaluations are influenced by factors such as student socioeconomic level, class size, age and grade level, test performance, etc.

PROGRESS: Tests have been field administered in approximately 200 classes of varying socioeconomic level, size, and grade level. Teachers' and observers' records of student test-taking behavior have been obtained for each administration. A preliminary analysis of these data, as well as item analysis data, has been completed. It is anticipated that, after some further analysis, a report on the study will be prepared this fall.

MAJOR FINDINGS: Tentatively, it appears that there is considerable agreement between teacher and observer evaluations of student test-taking behavior, and that there are some differences between high SES pupils and low SES pupils both in test performance and in test-taking behavior.

Multivariate Statistical Analysis (70-1)

Mr. Harman

PURPOSE: This project constitutes a continuing effort of research and development in the area of multivariate statistical analysis either in the early stages of an activity, before it has been sufficiently well structured to be given a specific project designation, or in the exposition and communication of such methodology.

PROGRESS: The Manual of Scientific Programs, comprised of about a dozen computer programs in the area of multivariate statistical analysis and operations research, has been distributed. The programs, originally written for the 7044, have been adapted for the IBM 360/65. Additional programs are being incorporated on an ongoing basis.

Variance Analysis System--MANOVA (70-2)

Mr. Hall

PURPOSE: This project is intended to explore a general system covering correlation analysis, factor analysis, and analysis of variance and covariance and its associated computer programs.

PROGRESS: The development of the system is progressing in two main sections. The sections are divided into that portion which generates the sums-of-squares for analysis from the raw data and that portion which performs the analysis.

The section which generates the sums-of-squares has recently concerned itself with the coding system for entering the statistical model into the machine. This complex procedure is nearing completion.

The section which analyzes the sums-of-squares currently includes correlation and analysis of variance procedures with 21 varieties of output for analysis of variance. Also included are three varieties of battery reduction procedures for multivariate problems and four varieties of rotation procedures for canonical analysis.

Factor Analysis (70-3)

Mr. Harman

PURPOSE: Research and development work and computer programming related to factor analysis.

PROGRESS: Several computer programs on methods of factor analysis (Minres, Direct Oblimin, and Unrestricted Maximum Likelihood) have been adapted for use on the IBM 360/65 and have been included in the Manual of Scientific Programs. In addition to internal use, these programs appear to be widely used by non-ETSers, if the continuing requests for them are any criteria.

The project director has been working with Dr. Kockova-Kratochvilova of the Institute of Chemistry, Slovak Academy of Sciences, Bratislava, Czechoslovakia, on a study of yeast in which the minres method of factor analysis plays an important role. They are planning to publish the results in the third volume of Taxometric Study of the Genus Saccharomyces (Meyen) Reess.

Another study concerns the application of factor analysis beyond its well established use in psychology--fields as varied as sociology and meteorology, political science and medicine, geography and business. A bibliography, consisting of some 200 titles and assembled over the years, is currently being summarized preparatory to writing a paper for journal publication.

Model for ETS Shipping (70-21)

Mr. Lavine

PURPOSE: To design and program a simulation model that will permit program directors, analysts, and others to evaluate alternative strategies for shipping test materials.

PROGRESS: This project has been quiescent for most of the year. The simulation program is available, but other pressing requirements made it difficult to carry out further work. The next effort should be a pilot study in one of the ongoing test programs.

Scheduling Techniques (70-22)

Mr. Lavine

PURPOSE: Research, development and adaptation of existing programs concerned with general problems of planning and scheduling of time and cost.

PROGRESS: Two staff members attended an IBM course designed to familiarize them with a PERT system (PMS) programmed for the 360/65.

PMS was used for the first time to assist the Division of Educational Studies in the preparation of a major proposal to the Office of Education. It was useful in helping them to recognize and compensate for scheduling problems. Unfortunately, costing calculations could not be carried out with the system. Trial runs designed to isolate and identify the difficulties with costing will continue so that both scheduling and costing may be provided for future users.

A PERT network is being prepared to define the activities required for implementing major changes contemplated for the CEEB Admissions Testing Program. Several versions have already been discussed and refined in collaboration with members of the Long-Range Committee considering these changes.

College Board Activity and Participation Statistics
(CEEB, 130-2)

Miss Pitcher

PURPOSE: This study is concerned with the preparation of selected descriptive statistics on College Board candidates to describe patterns of test participation with particular reference to shifts that may affect score interpretation and program planning.

PROGRESS: Candidates and Tests, 1968-69 was completed and distributed.

MAJOR FINDINGS: Candidate and test volume in the admissions testing program continued to increase, but at a lower rate than in the past year. Four indices of overall testing activity used in the admissions testing program showed the following changes in 1968-69 over 1967-68 volume: (1) an increase of 3.3% in number of Scholastic Aptitude Tests administered, (2) a decrease of 0.5% in number of Achievement Test series, (3) an increase of 2.2% in total test volume, and (4) an increase of 4.5% in number of registrations. The number of Preliminary Scholastic Aptitude Tests increased 5.1%.

Curricular Appropriateness of the College Board
Science Achievement Tests (CEEB, 130-8)

Mr. Thompson

PURPOSE: To determine if the tests are equally appropriate for students of the newer and students of the more traditional high school science courses.

PROGRESS: Six forms of the Biology Test, eight forms of the Chemistry Test, and eight forms of the Physics Test have been analyzed. Scores on the science tests of students from different courses have been adjusted for the performance of these students on SAT and questions in the science tests rated appropriate for students of the different courses. The two latest forms of each science test were analyzed for samples based on student replies regarding courses studied and for samples based on teacher verifications of student replies.

MAJOR FINDINGS: Results to date indicate that the Biology, Chemistry, and Physics Achievement Tests are equally appropriate for students of the newer and the more traditional high school science courses. These results hold true for students whose replies about the course they studied were verified by their teachers.

Results for the Physics Test are reported by Guenter Schwarz and Raymond E. Thompson in "The College Board Physics Achievement Test," The Physics Teacher, Vol. 7, No. 3, March 1969. An ETS TDR summarizing all results is in progress.

American History Essay Study (CEEB, 130-9)

Mr. Modu

PURPOSE: The purpose of the study is to determine whether an American History and Social Studies essay test adds anything to the pool of information presently obtained from an all-objective examination of the College Entrance Examination Board.

PROGRESS: Cost estimates for the study are presently under way. The American History essay test will be administered in March 1971.

PSAT-AIM Norming and Follow-up Study
(CEEB, 140-80)

Mr. Katz

PURPOSE: The major research objectives of this study include: (1) the development of grade 10 norms for the PSAT, (2) the revision of grade 11 and 12 PSAT norms, and (3) the development of norms and other materials for the use and interpretation of the Academic Interest Measures (AIM).

PROGRESS: Three sequential phases of research were planned. Phase 1 was directed toward the development of norms for both PSAT and AIM and toward gathering evidence of AIM's construct validity; phase 2 was concerned with determining the internal consistencies and one- and two-year stabilities of AIM scale scores; phase 3 centered on investigating the predictive validities of AIM scales.

Analyses of data for all phases have now been completed, and a final report is being prepared. Norms for PSAT at grade levels 10, 11, and 12 have been published in College Board Score Reports, 1969.

Black Students at Predominantly White Colleges:
A Research Description (140-93)

Mr. Centra

PURPOSE: How do the background characteristics, activities, goals, and perceptions of black students at predominantly white colleges differ from their white counterparts? Findings from the "Questionnaire on Student and College Characteristics" (QSCC) were combined with research results from other sources in order to shed light on these questions.

PROGRESS AND MAJOR FINDINGS: A sample of 249 black students at 83 traditionally white institutions had responded to the QSCC in 1968. The similarities and differences between this group of black students and a matched group of white students are discussed and related to other research evidence. These findings are reported in RDR 69-70, No. 2, RB-70-19.

The College Environment Revisited: Current Descriptions Mr. Centra
and a Comparison of Three Methods of Assessment (140-93)

PURPOSE: The "Questionnaire on Student and College Characteristics" (QSCC), designed to provide information about colleges that would be of interest to prospective students, was administered to upperclass students at over 200 institutions. The 135 items in the instrument elicit student perception and student self-report kinds of information relating to each institution. The purposes of this study were to gain a better understanding of QSCC item relationships, to identify dimensions that differentiate among four year institutions, and to compare methods of assessing college environments.

PROGRESS AND MAJOR FINDINGS: The results are presented in RDR-70-71, No. 1, RB-70-44. This report consists of three sections. In the first section, a factor analysis of the 77 perceptual items in the QSCC is presented and discussed. In the second section, student perception and student self-report data from the QSCC were combined with published, objective information about each institution in order to investigate differences among college environments further. A total of 53 institutional characteristics were factor analyzed, resulting in six factors: Athletic vs. Cultural, Size with Cliquishness, Elitism, Activism with Flexibility, Student Satisfactions, and Social Life.

The three methods of assessing the college environment--student perceptions, student self-reports, and objective institutional data--were also compared by use of multimethod factor analysis, a new technique which removes method variance by focusing on correlations between rather than within methods of measurement. These results are presented in the third section of this report. Several of the appendices in this report include additional analysis of items in the QSCC.

Differential Weighting of Item Distracters
in Data Sufficiency Items (CEEB, 141-5)

Mr. Donlon
Mr. Dunteman

PURPOSE: Differential weighting of wrong-answer responses to multiple-choice items may provide additional information not currently reflected in the conventional scoring methods. Data sufficiency items would seem to offer particular promise in that the meaning of responses is constant for all items regardless of content. A comparison will be made of the efficiency of an a priori weighting system and a system using the judgments of mathematics specialists.

PROGRESS: The experimental tests were prepared and administered to approximately 1800 freshman students at seven colleges. Judged estimates of option merits have been secured, and grade-point averages have been received from the schools. Preliminary analyses of the data revealed that none of a number of empirically or rationally derived composite scores, based upon different linear combinations of the different response category scores, yielded an alternate forms reliability as high as the Total Rights score alone.

A number of additional analyses are being performed. They include determining the composite weights by canonical correlational analysis, principal components analysis, and multiple regression analysis, using the Mathematics Achievement Test as the criterion. Validities are being determined for those linear combinations that have a reliability greater than the Total Rights score reliability.

Assessment of Junior College Student Concerns
(CEEB, 141-10)

Mr. Warren

PURPOSE: An instrument is being developed to assess the views of junior college students about their college experiences and the congruence or disjunction they see between their experiences and their reasons for being in college. The instrument is to provide a vehicle for communication between students and staff.

PROGRESS: Interviews with junior college students, faculty members, and administrators, followed by summary conferences, have provided the content and guides for the format of the instrument. An experimental instrument has been completed. A program of trial administrations in about 30 junior colleges is planned.

Summary of CLEP Research (CEEB, 142-1)

Mr. Sharon

PURPOSE: A summary was made of all currently available research reports concerned with the empirical validity of the CLEP General Examinations. Much of the validity research on the examinations has been conducted by individual colleges and universities. In addition, ETS has gathered some validity-related data in the course of developing norms for various groups of college students and Armed Forces personnel.

Two different types of empirical validity are discussed: criterion-related and construct validity. Criterion-related validity is useful for prediction of future performance and assessment of current achievement level. Construct validity, on the other hand, aims to increase understanding of the educational or psychological attributes measured by a test. The criterion-related validity of the General Examinations was described in terms of the relationship of the tests to college grades. The construct validity was described by the effect of college instruction on test performance and by the differential performance of various types of subjects on the examinations.

PROGRESS: The summary has been completed and the report is presently available (RDR-69-70, No. 5, RB-70-38).

MAJOR FINDINGS: While most of the research provides support for the validity of the examinations as measures of academic achievement in college, the results of many of the studies have alternative explanations. The examinations correlate positively with course grades and amount of previous college instruction. Significant gains on the tests are generally made by students over the first two years of college and the highest scores on each test are obtained by students intending to major in the subject covered by the test. There is some question as to whether each of the five examinations is measuring a unique factor.

PAA-SAT Equating Study (CEEB, 142-5)

Mr. Angoff

PURPOSE: The purpose of this study is: (1) to attempt to relate the 200-800 scales for Puerto Rican PAA to the 200-800 scales for the SAT, and (2) to determine, if possible, the nature of the items that fail to have the same psychological meaning in the two language-cultures. The method of the study is to choose sets of items originally appearing in Spanish and others originally in English, translate each into the other language, and administer both sets in the appropriate language mode to both types of students. Items showing little item x group interaction would then be chosen and assembled as "common" items comprising equating sections in English and in Spanish. These equating sections would be used to equate the scales in the two languages.

PROGRESS: The items that will be considered for this study have been chosen and are now in the process of being translated, English to Spanish and Spanish to English. The translation is scheduled for completion toward the end of March and will then be sent to the College Board-Puerto Rican office for review (Math items: March 18; Verbal items: March 26). When the translations are returned from Puerto Rico they will be assembled into 10 Spanish pretest forms (5 Verbal and 5 Math), requiring 25 minutes of administration time, and 8 English pretest forms (4 Verbal and 4 Math), requiring 30 minutes of administration time.

The first of the two phases for this study, involving the examination of the items for appropriateness to students in both languages, will be completed in March 1971. Assuming that a sufficient number of equally appropriate items can be chosen, the equating sections will be assembled in the spring of 1971 and administered along with the operational forms of PAA and SAT in November 1971. The final analysis of the equating and the report should be available in the spring of 1972.

A National Survey of Educational Interests, Aspirations,
and Finances (CEEB, 142-6)

Mrs. Haven
Mr. Horch

PURPOSE: The purpose of this survey is twofold: (1) to gather information on students' educational and vocational interests and aspirations and (2) to learn how students support themselves in college--what were their sources of income and how much they spent during the 1969-70 academic year if they were enrolled full-time in some school or college. Expense and resource budget components for single students will be examined separately by type of domicile and by race (minority/majority). The data will examine what effect, if any, student indebtedness has on persistence in college and on plans to attend graduate or professional school. Special attention will be focused on financial aid and how it is packaged. This study will update information in the previous Haven-Smith and Schlekot studies in this area.

PROGRESS: The current schedule provides for the mailing of a 20-item questionnaire during the last week of June 1970 to approximately 8,600 students who were identified in the PSAT-AIM Study as attending some school or college in the Spring of 1969. Most of the summer will be spent in gathering data and editing returns. Data analysis will be done in the Fall of 1970.

Mathematics Coaching Study (CEEB, 142-9)

Mr. Pike
Mr. Evans

PURPOSE: This study will investigate whether student scores on Quantitative Comparison, Data Sufficiency, and Traditional SAT-Mathematics items can be substantially increased by coaching combined with short-term instruction. Comparisons among score gains associated with coaching/instruction directed to each of these item types will be made. Changes in test-making strategy, mathematical information, and test anxiety resulting from the coaching and instruction will also be examined, and related to score changes.

There will be three treatment groups (those receiving coaching and instruction based on each of the three item types noted), and two control groups (self-instruction). Sixty subjects will be selected from each of 12 high schools. Within each school, subjects will be randomly assigned to the two control groups and two of the treatment groups. To ensure a consistently high quality of coaching and instruction, the study will provide for the careful selection and training of instructors and the development of workbook materials by specialists in mathematics curriculum who are familiar with teaching high school mathematics, with testing, and with writing instructional materials. The most direct measure of the results of coaching and short-term instruction for SAT-M will derive from a pretest and a posttest, patterned after SAT-M. Related measures will include self-reports on test anxiety, as well as subjects' "category width," "field dependence," and tolerance for the ambiguity associated with the response formats of Data Sufficiency and Quantitative Comparison items.

PROGRESS: Coaching materials for two of the item types have been developed and are ready for pretesting. Instruction will begin in October 1970.

Project Access Evaluation
(CEEB, 174-1)

Mr. Sharon

PURPOSE: Project Access is an effort to make higher education possible to disadvantaged high school students who may not have thought of attending college. The evaluation of the Project attempts to answer the following three questions: (1) Have students who would not ordinarily apply or enroll in college done so because of Project Access? (2) Which elements of the Project were most effective and which least effective? (3) How might the Project be improved?

PROGRESS: Approximately 70,000 juniors and seniors in 99 inner-city high schools were tested with the PSAT and completed a short questionnaire. This information was reported on rosters to all participating high schools and to more than 500 colleges. The evaluation phase of the Project consisted of mailing follow-up questionnaires to all participating schools. About one-third of the schools returned the questionnaires assessing reactions and soliciting suggestions to the instruments which were employed in the Project. Only a very small percentage of the questionnaires requesting follow-up information on specific students were returned. About 170 students were interviewed about their reactions to the Project. A restricted report entitled "Project Access Evaluation" has been prepared for the Ford Foundation. A condensation of this report available for general distribution is in "Project Access: Summary of 1968-69 Activities" (PR-70-8).

MAJOR FINDINGS: Results and indications at the end of the first year of Project Access may be briefly summarized as follows:

1. Schools and school systems were willing to participate in an experimental effort on behalf of their students, even though it imposed sizable additional testing and counseling burdens on staffs that already had heavy work loads.
2. With few exceptions, the project was well-received by students, and student participation was high.
3. Information about large student populations can be collected, compiled, and disseminated broadly to post-secondary institutions in a comparatively short time.
4. Generally speaking, school and college staffs cooperated effectively with each other and with the College Board to plan and carry out meetings and workshops.
5. Project Access reached substantial numbers of students who apparently had not previously been involved in college-oriented efforts such as testing for scholastic aptitude.
6. Significant numbers of students were contacted about going to college who would not have been contacted had Project Access not existed.

7. Judging from the numbers of college applications and applications for financial assistance, Project Access appears to have encouraged a substantial number of 1968-69 seniors to seek post-secondary education. The project will probably have a considerably greater influence on 1968-69 juniors than on seniors.
8. The instruments and procedures employed by Project Access in the first year were generally satisfactory to the users, but several improvements can be made on the basis of the first year's experience.

An Analysis of the CGP Satisfaction Questionnaire
(CEEB, 175-1)

Mr. Modu

PURPOSE: The purpose of the study was to explore the dimensions and the stability of the factor structure of a Satisfaction Questionnaire administered in 1967 and 1968 during the experimental phases of the Comparative Guidance and Placement Program of the College Entrance Examination Board.

MAJOR FINDINGS: The results produced relatively homogeneous scales indicative of the extent of a student's satisfaction or dissatisfaction with his English courses and mathematics courses as well as his major field and whether he had switched to a lower or more advanced course in English or math. The Satisfaction Scales were found to bear no relationship to college grades, and the factor structure remained stable over the two administrations. A report has been issued (RDR-69-70, No. 1, RB-70-17).

Remediation in Junior College (CEEB, 175-1)

Mr. Sharon

PURPOSE: The major objective of this experimental study was to determine how effective are remedial courses in junior colleges--do they in fact prepare the student for subsequent work? A second purpose was to determine how effective are present placement policies and instruments--do they place students in the highest level course they can successfully complete?

PROGRESS: Two Connecticut community colleges have placed some of their students identified for remediation into regular English and math courses on an experimental basis. Comparisons were made on a variety of predictor and criterion data gathered on students who did and did not receive remediation. These included measures of ability, interest, motivation, persistence, and performance. A draft report on the study has been completed.

MAJOR FINDINGS: Some of the remedial English courses considered in this study had a slight but significant effect in raising the grades in the subsequent regular English course. The single math remedial course which was evaluated appears to be more effective than the English remedial courses. The course improved the performance of the students in the subsequent regular course by more than a half of a letter grade. In addition, the students were much more satisfied with it than with the regular course. A fair evaluation of the placement procedures is difficult to make. Since the failure rate in the regular courses is very low, identifying those few who would fail is a formidable task for any placement system. The placement procedures are apparently more effective in assigning students to appropriate math courses than to appropriate English courses.

Chicago Model Cities CO-PLUS Evaluation (CDA, 260-1)

Mrs. Hsia

PURPOSE: Chicago Model Cities evaluation is intended to assess changes in the community over time with respect to achieving objectives and analyzing the relationships between such changes and the program efforts. An evaluation design is to be established and pilot tested. Evaluation is to determine if objectives stated for the project are being achieved and if such achievement is of notable benefit to the community.

PROGRESS: Program planning was initiated and the project was undertaken in May 1970. Basic design and accompanying instrumentation efforts have been completed.

Minneapolis Compensatory Education (Mpls, 260-10)

Mr. Norton

PURPOSE: A review is to be conducted of the contents of summary evaluation documents for compensatory education projects conducted in the Minneapolis Public Schools from Summer 1965 through Spring 1970. The review is to be conducted so as to identify, if and as possible, (a) evidence of program effectiveness and (b) important methodological strengths or deficiencies present in the reports.

PROGRESS: The project was initiated in May 1970.

IMS Advancement Tests (381-1)

Mr. Ironside

PURPOSE: To develop criterion-referenced test items (grouped into pre- and posttests for each teaching unit) for 10 topics and 10 difficulty levels of the Individualized Mathematics System, a project of RELCV (Durham); items to be based on study of both objectives and instructional materials; items to require manipulatory, perceptual, and/or abstract behaviors by children in grades 1 through 6 or 7. To begin exploration into theory and practice in the development and implementation of such test items.

PROGRESS: ETS Princeton staff developed approximately 400 test items, and also conducted a workshop in Durham for 14 local item-writers who then produced approximately 1200 items under the supervision of SEO staff. All items were reviewed and edited at SEO, and were submitted to the client for the first 5 of the 10 difficulty levels. As agreed, the product was un-prettested raw material, suitable for the client's own pretesting, review, and/or tryout in pilot schools during the period of development. The 1600 test items included about 200 "extension tasks"--an effort to get at the subjects' transfer away from the confines of the particular instructional system. Tests have been printed by the client and are in spring and summer use with pilot classes. The report was submitted in May 1969.

EIP Assessment of Impact (385-1)

Mr. Ironside

PURPOSE: To determine the impact of the Durham Education Improvement Program on the local school systems and the community at large over EIP's 5-year tenure in the area. EIP was funded handsomely by Ford Foundation, had as its major goals both experimentation and demonstration in the education of disadvantaged children, and concentrated on intervention programs with children from birth through middle elementary school.

PROGRESS: All phases of investigation have been initiated: interviews (with teachers and principals in target schools, school administrators, community action groups, parents, other educational agencies, EIP staff); questionnaire survey of school people not directly involved; study of correspondence, records, publications, visits. Particular attention being paid to the local and more distant by-products and spin-off effects.

MAJOR FINDINGS: Thus far, (a) virtually nothing of the whole EIP venture has been incorporated or internalized by local school officials to carry on after EIP leaves, (b) individuals have been most impressed by one program feature, the nongraded primary.

GRE Advanced Tests as a Predictor of Law School Grades
(LSAT Council, 480-13)

Mr. Schrader
Miss Pitcher

PURPOSE: This study was designed to find out whether scores on the GRE Advanced Test would provide useful predictive data for law school admissions. Because college grading systems are currently changing, attention was given to the possibility that GRE Advanced Test scores might serve as an alternative to college grades as a predictor.

PROGRESS: Advanced Test scores were obtained by a special administration of the tests in the fall of 1966 at six law schools. A separate validity study was made at each school. In addition, data from five schools were pooled, by assuming equal means and standard deviations of each variable at each school, and a validity study was made for each of six major field groupings. A report is available (SR-70-49).

MAJOR FINDINGS: Results indicated that GRE Advanced Test score yielded higher validity coefficients than did the Law School Admission Test and that when each was used along with undergraduate average grade, the multiple correlation coefficients were about equal for the two. On the other hand, GRE Advanced Tests added only slightly to predictive effectiveness when used along with LSAT and undergraduate average. Finally, GRE Advanced Test scores yielded a moderate increase in prediction over LSAT used alone but the GRE-LSAT combination was less effective than a combination of LSAT with undergraduate average. In this study, the use of different prediction equations for different major field groups did not appear to be a promising approach to improving prediction.

Advanced Moderator Variable Study
(LSAT Council, 480-15)

Mr. Rock
Mr. Evans

PURPOSE: This study is investigating the moderating effects of certain background variables on the prediction of law school grades. It also is examining whether a number of new tests would act as moderators or predictors.

PROGRESS: Progress is now being made in the construction of a performance measure to assess certain personality traits. A battery of tests was assembled and pretested. This battery was searched for both moderators and predictors to be included in a final battery for administration in the fall of 1969. Preliminary analysis of the pretest has resulted in the construction of the final battery. The final battery has been administered and criterion information is presently being collected.

LSAT Factor Analysis Validity Study
(LSAT Council, 480-19)

Mr. Carlson

PURPOSE: To further our understanding of the abilities measured by the tests and to provide suggestions as to the utility of classification of items based on ability, as well as the relative predictive validity of the abilities currently being measured.

PROGRESS: Report in progress.

Interpreting Performance of Foreign Law Students on LSAT
and TOEFL (LSAT Council, Orientation Program in American
Law, CEEB, 480-31)

Mr. Schrader
Miss Pitcher

PURPOSE: The main objectives of this study were to validate LSAT and TOEFL scores for foreign law students, using performance in four American law schools as the criterion, and to determine the extent to which performance on these tests changed between the beginning and the end of an intensive eight-week summer program, the Orientation Program in American Law (OPAL).

PROGRESS: Both LSAT and TOEFL were administered near the beginning and near the end of the OPAL program in the summer of 1968. Data were also available on the Michigan Test of English Language Proficiency taken before entering the course and on performance in the summer program. Law school grades were supplied by four law schools. The validation sample included 63 students. Data for the four law schools were pooled, assuming equal means and equal standard deviations for each variable in each school. A report has been completed (SR-70-25).

MAJOR FINDINGS: (1) For tests administered at (or before) the beginning of the summer program, validities ranging from .41 to .47 were found for the following scores: LSAT, TOEFL Writing Ability, TOEFL Reading Comprehension, TOEFL Total, and Michigan Test of English Language Proficiency. Although the small sample size prevents drawing firm conclusions, it appears that a variety of tests offered useful predictive information. (2) Gains from the initial to the final test were statistically significant for LSAT and for all TOEFL scores except Reading Comprehension. Of TOEFL part scores, Listening Comprehension showed the largest gain.

Summary of LSAT Research (LSAT Council, 480-33)

Mrs. Flesher

PURPOSE: This project attempts to put together in one place succinct and comprehensive summaries of all research carried out over the past 20 years for the LSAT program. The summaries will be for the edification of law school admissions officers, new Committee members, educators, and psychologists.

PROGRESS: Twenty-eight studies carried out under ETS auspices have been summarized according to a common format. These summaries, together with a bibliography of non-ETS research on the Law School Admission Test, have been compiled in notebook form, entitled Summary of LSAT Research. The notebook was distributed to the LSAT Council members prior to their June 1970 meeting.

As future research studies on the LSAT are carried out at ETS, similar summaries will be prepared and added to the notebook so that it should remain updated.

LSAT Speededness Study (LSAT Council, 480-35)

Mr. Evans

PURPOSE: This study was undertaken to determine if the LSAT is more speeded for candidates who are members of ethnic minorities than for white candidates. Two forms of margin lengths of the LSAT were administered to approximately 500 candidates from predominantly black undergraduate schools (approximately one-half received each form). These same forms were administered to random samples of candidates from regular LSAT centers.

PROGRESS: Data have been collected and are in the process of being analyzed. A final report is expected early in 1971.

Discriminant Function Analysis of Law School
Performance (LSAT Council, 480-37)

Mr. Schrader
Miss Pitcher

PURPOSE: To test the assumption made in conventional validity studies that the best weights for distinguishing between top students and average students are the same as those for distinguishing between poor students and average students. Data for 26 law schools which participated in the 1968-69 LSAT Validity Study Service will be used.

PROGRESS: Using programs developed by Charles E. Hall, analyses have been made to test the hypothesis that more than one canonical function would be needed to describe the three groups.

Investigation of Graduate Admissions Policies and
Procedures (GRE Board, Phase I, 540-31; Phase II,
540-32)

Mr. Burns

PURPOSE: The basic purpose of this project is to collect and disseminate information on graduate admissions policies, procedures, and trends. The objectives will be (1) to provide information for the use of the GRE Board and ETS in planning its programs and activities in graduate admissions; (2) to inform the graduate school community of what kinds of procedures and policies are being followed at various institutions; and (3) to stimulate graduate school thinking and planning about their own admissions procedures and policies. A further objective may be to develop better GRE interpretative information as a result of the information derived from the project.

PROGRESS: The investigation has been conducted in two phases: Phase I involved a survey of all graduate schools, and Phase II consisted of visits of three days duration to six graduate schools by a member of the ETS staff and a graduate school assistant or associate dean from another school for the purpose of developing a case study of admissions procedures and policies at that institution. The survey and case studies have been conducted. An 85% usable response rate was realized for the survey. A draft report of the survey is currently being reviewed by the advisory committee. The case studies are in final draft and will be used with workshops in the fall. The Survey Report is scheduled for publication in August 1970.

Alternate Methods of GRE Advanced Tests
(GRE, 540-52)

Mr. Lutz
Mrs. Ford

PURPOSE: The study is to compare the current common-item equating of the GRE Advanced Tests to equating using the Verbal and Quantitative sections of the GRE Aptitude Test. The results will be generalized to the proposed sub-scores for the GRE Advanced Tests; however, since most of these tests currently have no subscores, the investigation will be made using total scores for most of the tests. The study is designed to answer the following questions:

(1) Does equating through the aptitude tests, in general, yield significantly different results than common-item equating? (2) How does the stability of equating through the aptitude tests compare to that of common-item equating across various administration months? (3) How does the stability of equating through aptitude tests compare to that of common-item equating across various educational levels of the candidates?

PROGRESS: All equatings using total sample have been completed. For five subject areas, score differences between equating methods did not exceed 50 scale points; for eight areas, differences of between 50 and 100 points were found for at least one form; and for four areas, differences of greater than 100 points were found for at least one form. There were no discernible effects resulting from subject area, except for Chemistry, Mathematics and Physics. Surprisingly, Engineering scores agreed more closely. Also, no differences, resulting from test month or candidates' educational levels, seemed evident, although this portion of the study has not been completed.

The Moderating Effect of TOEFL on GRE (GRE, 540-62)

Mr. Sharon

PURPOSE: Foreign students desiring to enroll in American graduate schools are frequently examined with both the Test of English as a Foreign Language (TOEFL) and the aptitude tests of the Graduate Record Examinations. No information is presently available as to whether TOEFL adds to the predictive validity of the GRE for foreign candidates. The two tests will be combined through nonlinear regression to predict first-year grade-point average. It is hypothesized that GRE will be found to be a valid predictor only for those who score high on TOEFL.

PROGRESS: Twenty-four graduate schools provided GRE and TOEFL scores and grade-point averages for a total of 978 of their foreign students for whom these data are available. The data are currently being analyzed. A report will be submitted to the GRE Board.

TOEFL Score Ranges and Theme Writing Samples (575-8)

Mr. Echternacht

PURPOSE: To develop alternatives to rating scales for determining the English Proficiency of foreign students.

PROGRESS AND MAJOR FINDINGS: The study was completed (SR-70-8) and the following reported:

1. Each subject was placed into one of four English proficiency categories on the basis of the sum of his theme ratings.
2. Total TOEFL score distributions for each of the four proficiency groups was computed.
3. The range of the middle 50% and 80% of the frequencies of each distribution was determined and used to develop tables indicating TOEFL score ranges for each level of proficiency.
4. Sample themes were given for each proficiency level and related to TOEFL scores.

TOEFL Language Study (CEEB, 575-11)

Mr. Angoff
Mr. Sharon

PURPOSE: The purpose of this study is to determine whether any differences exist among the English language error patterns of six language groups of college candidates who have taken TOEFL. The results should provide evidence relating to the construct validity of TOEFL and indicate to teachers of English as a Foreign Language the type of instructional emphasis they should give to students of different language backgrounds.

PROGRESS: An item analysis of each of the five parts of TOEFL, separately for each of the six language groups, and an analysis of variance for each part as well as for the total score have been completed. Delta plots for pairs of languages will indicate which items are not behaving in the same manner for the different languages.

Classroom Variables (OEO-ETS, 581-5)

Mr. Medley

PURPOSE: The mission of the classroom task force in the ETS-OEO Longitudinal Study is to obtain comprehensive records of the classroom experiences of each of the children in the study and to develop procedures by which information relevant to hypotheses to be tested in the study can be extracted from the record in quantitative form suitable for statistical analysis.

PROGRESS: An instrument called the Personal Record of School Experience (PROSE) has been developed and pretested. Nine housewives were trained to use the instrument and they collected data on over 700 pupils in 38 Head Start classrooms and day care centers in the three cities involved in the study.

Disadvantaged Children and Their First School Experiences:
A Longitudinal Study (OEO-ETS, 581-11)

Mr. Benson
Mr. Smith
et al.

PURPOSE: The purposes of this study are to identify the components of early education that are associated with the cognitive, personal, and social development of children; determine the environmental and background factors which influence such associations; and describe how these influences operate. The children will be followed longitudinally from pre-Head Start through the end of the third grade.

PROGRESS: Approximately 1700 children were tested in Spring and Summer of 1969. In the Fall of 1969, and continuing through Spring 1970, Head Start classes were observed, PROSE ratings were made, and children were tested with a six-hour test battery of more than 30 instruments. Parents were interviewed in test centers. Coding and processing of 1969 data were begun.

MAJOR FINDINGS: See PR-69-12, "Disadvantaged Children and Their First School Experiences: From Theory to Operations," August 1969.

PR-70-2, "Disadvantaged Children and Their First School Experiences: The Sample; Operations in the Head Start Year," February 1970.

National Assessment (582)

Miss Anderson
Mrs. Barron

PURPOSE: To develop materials for the assessment of the progress of education of four age groups (9-, 13-, 17-year-olds and adults) in six disciplines: writing, literature, science, social studies, art, and music. (Other contractors are working in reading, mathematics, career and occupational development, and citizenship.)

PROGRESS: The first operational year has ended. Measures in three areas (writing, citizenship, science) have been administered; the results are being analyzed and preliminary findings will be announced in July. Reading and literature will be assessed during 1970-71; music and social studies are scheduled for 1971-72.

Work has begun to ready the areas in the current administration for a second cycle (tentatively scheduled for 1973-74). The reexamination of original objectives, expansion or revision of the statements of the objectives as needed, and further exercise development in the area of writing are being carried out under Mr. Robert Jones' direction.

Presbyterian Curriculum: Readability
and Usability (584-8, 584-9)

Mr. Ironside

PURPOSE: To study newly-written curriculum materials (instructional books, sources, manuals) for their suitability to students and teachers, in terms of readability and subjective reactions; "readability" here is defined principally as "difficulty." (584-9 covers occasional consulting work.)

PROGRESS: The work has been completed and reported on for the student materials of grades 1-8: employment of readability formulas on a total of 166 samples of continuous text; and interviews along with cloze-tests (original text with deleted words) and exercises with a total of 587 subjects in 11 locations on 23 different samples of material. Work is completed also on the use of formulas and subjective reactions to samples from the teachers' manuals and other source materials. (Consulting has been provided concerning objectives specification, bases for revision, writing exercise items, and future field test procedures.)

MAJOR FINDINGS: As suggested by formula outcomes, materials prepared for grades 1-4 are generally too difficult for independent reading in those grades; for grades 5-8, materials appear more appropriate in terms of difficulty. However, in terms of direct work with children, based on cloze-test scores, interview reactions, and completion of exercises, most of the selections studied were found to be too difficult, too complex, and/or too long for adequate handling in the usual Sunday morning setting; and in addition, most materials were rated as overly academic by both teachers and students. Teacher guidebooks were found to be of appropriate difficulty, but appeared to lack appeal and variety. The comprehensive final report was submitted to the client in July 1969 as PR-69-15.

Preschool Television for Children (584-18)

Mr. Ball

PURPOSE: Children's Television Workshop telecasts Sesame Street, a preschool children's show which is both entertaining and educational. The hope is that preschool children who watch will be the better prepared for school experiences.

PROGRESS: During the period July 1, 1968 to December 31, 1968, ETS has provided consultant services to help CTW develop both behavioral objectives and formative research procedures. In addition, a summative research proposal was written by ETS. Instrument-development proceeded from January through June, and in July 60 children were pretested and posttested using these instruments. Variables measured included knowledge of letters, numbers, forms, body parts and relational terms, and skill at classifying and sorting. A parent-interview was developed and tried out as well.

From September to November 1969, 1,300 children were pretested as part of the major evaluation of Sesame Street. These children, all 3-5 years old, came from Boston, Philadelphia, Durham, Phoenix, and northern rural California. From November 1969 to May 1970 the children were observed viewing Sesame Street and amount of viewing was assessed. The content of the show was analyzed in terms of the show's objectives.

In May 1970 the posttests were administered. During June and July the data will be analyzed and by the end of August a final report will be made.

Perspectives on Law Enforcement: 1. Characteristics of Police Applicants (584-19)

Mr. Goldstein

PURPOSE: This study was proposed as a joint venture by the New Jersey Police Training Commission and Educational Testing Service in order to increase our knowledge about the characteristics of police applicants and to provide information which might be utilized by police administrators in the formulation of their policies relating to recruitment, selection, classification, and training. There are three major objectives: (1) to describe a sample of police applicants along a number of relevant psychological dimensions and to compare this group with others wherever possible, (2) to determine whether police applicants differ across communities and whether such differences relate to definable community characteristics, and (3) to determine the similarities and differences between those applicants who pass and those who fail the Civil Service examinations. Corollary to this objective is the goal of determining the characteristics of eligibles if the qualification criteria were modified.

PROGRESS: The first six months of the project were concentrated on the selection and development of instruments to be used in the description of the applicant's characteristics. A battery of five instruments was developed which consists of: (1) a Police Background Information Form, (2) the Personality Inventory, (3) the Police Opinion Questionnaire, (4) the Police Knowledge Tests, and (5) the

Discretionary Situations booklet. Testing with this battery has been done at various police training academy sites in New Jersey, where the candidates were also given a Lorge-Thorndike Intelligence Test. Posttesting with this battery, excluding the intelligence test and the Background Information Form, was done at the conclusion of the course of training. The same battery of instruments has been used in testing Civil Service police applicants at various locations within the state. In place of the Lorge-Thorndike Intelligence Test, these men received the regular Civil Service examination which is a general information type test. The applicants who pass this examination and subsequent physical, medical, and psychiatric examinations may receive assignment within a police jurisdiction and attend a training course at one of the 14 police academies. Follow-up plans for this study would incorporate the retesting of these individuals after they have completed their course of training and once again after approximately one year of service on the job.

MAJOR FINDINGS: A sample of the data, approximately 40% of the cases that will be collected by the end of June, have been analyzed. Statistically significant differences between the applicants who passed the Civil Service examination and those who failed were found on a number of items of each of the instruments. Data from the Background Information Form show that the pass applicants have a significantly greater educational attainment, have a lower rate of unemployment, come from smaller families, have a greater proportion of fathers who are considered skilled workers, and come from communities with populations between 10,000 and 100,000 compared with the fail applicants who generally come from cities of more than 100,000 population. A significantly greater proportion of the fail applicants indicate a religious affiliation other than Catholic, Protestant, or Jewish, and also a more strongly religious attitude than the pass candidates. The three subtests of the Police Opinion Questionnaire give some evidence that the successful applicants are somewhat more "realistic" than the unsuccessful applicants in the degree of danger they see inherent in various situations to which they may have to respond on the job, and also in the severity of the sentence which they would assign to various criminal offenses. On the Police Knowledge Test, the attitude of the fail candidates towards various minority groups such as Negroes, Spanish-Americans, and "hippies" seems to be less positive than that of the candidates who passed the examination. Those who passed also view the policeman's job as more routine than those who failed, and appeared to have a more pessimistic view about job promotion and pay. Of the 50 possible actions for the 11 Discretionary Situations, the unsuccessful applicants were more likely to choose a less favorable response. Data for the Personality Inventory have not as yet been analyzed. A final report for the complete sample which considers the findings on all the instruments will be prepared later in the year.

Brevard County Project (585-5)

Mr. Trismen

PURPOSE: To develop techniques for predicting student performance in an ungraded school situation (Melbourne, Florida). It is hoped that procedures will also evolve for using test and other data for placement and guidance.

PROGRESS: A Student Course Satisfaction Questionnaire and achievement tests for English, biology, and mathematics were developed and administered in the Melbourne High School during the 1967-68 year. Data from these, an American history examination, the regular school testing series, and school records are being analyzed. Phase placement reports were developed for the one school for the August 1968 registration. Data collection continued during the 1968-69 school year.

MAJOR FINDINGS: A final report to the Brevard County (Florida) School system has been prepared (PR-70-6).

Chicago Title I Evaluation (585-11)

Mr. Marco

PURPOSE: To provide help to the Chicago Public School System on the design and execution of evaluation studies for ESEA Title I projects for 1969-70.

PROGRESS: Reports were issued on 1967-68 objective achievement data, the follow-up of RESCUE, a project for emotionally-maladjusted youngsters; the follow-up of PEG, a kindergarten program designed to improve reading readiness, and questionnaire results from June 1969. The ETS staff also evaluated the team-teaching project, conducted another spring survey of opinions about Title I projects, analyzed same-grade over-time school data, and analyzed the items in the Omnibus Inventory, an instrument measuring self-esteem, concern for others, and attitude toward school. In addition some city-wide test scores of pupils enrolled in Title I programs have been obtained from master tapes.

Evaluation of Verona Plan for Sharing
Educational Opportunity (585-24)

Mr. Zdep

PURPOSE: This joint effort among the Boards of Education of Newark and Verona and ETS is designed to assess the outcomes of a project which involves the bussing of 38 ghetto school children from Newark to schools in suburban Verona. The study is focusing on 26 of these children who attend first and second grades.

PROGRESS: Pretesting and posttesting in the areas of achievement, affect, and operational problems encountered by teachers were conducted. A report was issued in April (RB-70-28).

MAJOR FINDINGS: Transported first graders displayed significantly higher average gains in reading, mathematics, and listening skills than did their counterparts who remained in the city schools. Among second graders, achievement mean gains were not significantly different for the two groups.

Achievement by suburban children in classes with transported students was not significantly different from that shown by similar classes without the city children.

Baltimore County Consultation Project (585-25)

Mr. Barrows

PURPOSE: Baltimore County, Maryland, has had several projects funded by the Education Professions Development Act. The projects provide training for teachers and administrators of various grade levels and are designed to promote a linguistic orientation to the teaching of language skills. ETS is providing consultation on evaluative techniques.

PROGRESS: Consultation has been and will be furnished as required during the period from May 1969 to October 1970. No written reports are planned.

Educational Program Audits (585-26)

Mr. Seibel

PURPOSE: Federal legislation authorizing Title VII (Bilingual) and Title VIII (Dropout Prevention) of the Elementary and Secondary Education Act requires that each funded project be subjected to an independent educational program audit. Basically, the audit is an independent (of the project) check on the project's evaluation of its product (students), process (treatment), and management (operation).

PROGRESS: Educational Testing Service is serving as Educational Program Auditor for four Title VIII (Dropout Prevention) Projects during 1969-70:

<u>Project-Job #</u>	<u>Project Title</u>	<u>Location</u>	<u>Audit Project Director</u>
585-26	Talent Development Program	Dade County, Florida	Dean W. Seibel
585-27	Potential Dropout Recognition and Prevention Program	Chautauqua, New York	J. Robert Cleary
585-29	Project Emerge	Dayton, Ohio	Dean W. Seibel
692-01	Project Stay	St. Louis, Missouri	Harry Delker

MAJOR FINDINGS: Interim audit reports for all four projects have been prepared and submitted. Final audit reports for 1969-70 will be submitted during the summer. It is expected that the auditing projects will continue during the 1970-71 academic year.

New York State Humanities Project (586-2)

Mr. Trismen

PURPOSE: To assist the New York State Department of Education in developing a questionnaire for a survey of humanities program. All of the 1500 public and independent secondary schools (grades 7 through 12) in New York State will be asked to respond. The questionnaire will provide information about course organization, objectives, and problems of administration.

PROGRESS: The questionnaire was developed as a joint effort with the client. It was administered, the data processed, and a final report is available (PR-69-18).

MAJOR FINDINGS: Population frequencies and proportions are reported, giving the basic description of the Humanities courses--the number of sections, total enrollment, length of course, and number of years the course has been offered. Information concerning the curricular organization, course materials and procedures, and the objectives of Humanities courses is also reported.

A Review of Current Interests and Accomplishments
in the Development of Children's Theatre (586-3)

Mr. Gordon
Mrs. Ferguson

PURPOSE: To gather information concerning criteria for judging the success (or failure) of recent activities in Children's Theatre projects designed to provide an opportunity for children to observe "live" theatre. The assignment was conducted for the New York State Council on the Arts.

PROGRESS: Records searched included those of: the United States Office of Education's ESEA Title III projects and The Educational Laboratory Theatre Project, The National Endowment for the Arts and National Council on the Arts, The American Educational Theatre Association, Incorporated. The preliminary report was completed and mailed to the client March 11, 1970. A revised report will be available in July 1970.

MAJOR FINDINGS: The criteria found to be most important to the success of presenting "live" theatre to children included: (1) the choice of the plays, (2) the objectives for presenting particular plays, (3) the method of presentation, (4) the quality of the performance, and (5) the conditions under which the play was presented. Of equal interest were the combined efforts of theatre educators and theatre professionals in the AETA, whose international conferences are directed toward Theatre in the Educational Process as it helps to develop new audiences and describe necessary research in the field.

Professional/Technical Assistance to the Head Start
Research and Evaluation Demonstration Program (OEO, 589-6)

Mrs. Ekstrom

PURPOSE: To perform certain services for the OEO Head Start Research and Evaluation Demonstration Program for the period June 30, 1967 to October 31, 1969. These services include the review of personnel, proposals, instrumentation, special studies, and reports as well as the administration of funds for various subcontracts.

PROGRESS: A number of reports completed under this contract were reviewed including a comprehensive report on Head Start, a reanalysis of the data on children attending Head Start in the summer of 1966, and a classroom description study. Reviewers were selected to consider a number of research proposals. ETS personnel attended two of the six research seminars held under this contract and an evaluation coordinators' meeting. The proceedings of the six seminars have been published. A collection of tests for use with preschool children has been compiled and indexed for use by the Head Start office staff.

Educational System Information Program (ESIP, 597-1)

Mr. Trismen

PURPOSE: To plan an information feedback program for educational systems. The development of the essential elements of such a program includes: definition of educational objectives, instrumentation, sampling techniques, data analysis, and reporting procedures. There will be a conceptualization of the interrelationships among these program elements. Pilot studies of prototype programs will be conducted.

PROGRESS: A proposal for the tryout of a small-scale prototype system has been prepared.

Educational System Information Program--Cincinnati (ESIP, 597-2)

Mr. Marco

PURPOSE: To develop a system for processing data obtained by item sampling.

PROGRESS: Data obtained from the Spring 1969 test administrations in math and socioeconomic problems have been processed; the system is now functional. Spring 1970 data will be used to test the system. Final documentation is being completed.

Taxonomy and Survey Project (597-4)

Mr. Trismen

PURPOSE: In September 1968, the U.S. Commissioner of Education and the Council of Chief State School Officers signed an agreement for the development of an evaluation system which will prove a data base for local, state, and federal program decisions. The project is a part of this joint federal/state effort. The Project Descriptor Instrument will be designed to: (1) provide precise descriptions of programs and projects funded by federal sources, (2) compare programs across funding sources, and (3) allow examination of the relationships among components of programs and projects.

PROGRESS: An interim report, issued in September 1969, described the site visits to state departments of education in Georgia, Florida, New York, Michigan, and Pennsylvania and to the U.S.O.E. These visits were for the purpose of examining documents descriptive of federally funded projects to ensure coverage of all important aspects of such projects. The resulting taxonomy is also included in this report.

A Project Descriptor Workbook has now been developed. A field test version of this workbook has been mailed to school districts for completion during the summer. The data from this instrument will be used as a pretest of the ability of the workbook to describe characteristics of programs funded by ESEA Titles I, III, VII, VIII, and the Vocational Education Amendments of 1968.

Error Choice Study (599-1)

Mr. Barrows

PURPOSE: This study is exploring the error choice technique of attitude measurement in the context of social attitudes toward Negroes. It is designed primarily to explore the psychometric characteristics and practical problems associated with the technique, and will measure the internal consistency of a set of error choice items and the relation of the set to two external criterion measures.

PROGRESS: A multiple-choice test containing error choice items has been administered with a Likert scale and several Semantic Differential scales. Data analysis is under way. A report is being prepared.

Achievement of Seven-, Eight-, and Nine-Year-Olds (599-2)

Miss Anderson

PURPOSE: Investigation of structures of cognitive ability at ages 7, 8, and 9. Data collected during the norming administration for the Cooperative Primary Tests will be used.

PROGRESS: Factor analyses are being conducted.

Models of Change and Response Uncertainty (599-3)

Mr. Trismen

PURPOSE: To apply certain of the models proposed by J. S. Coleman to data collected during an earlier study on measures of attitude (toward subject matter, course/phase, and marks) and achievement.

PROGRESS: Analyses of items and analyses following a more sophisticated Coleman model have been completed. Additional analyses are planned.

Motivation, Teaching, and Learning in the Classroom
(599-4)

Mr. Ball

PURPOSE: A large number of studies have investigated the effectiveness of different methods of teaching. Typically, subjects have been randomly assigned to learn under such conditions as discovery, guided discovery, and rule and example. However, results from these studies have been either contradictory or inconclusive. In a new study undertaken by Sam Ball the motivational styles of the learners were assessed, the hypothesis being that certain teaching methods are differentially useful depending on the learner's motivations. For example, discovery techniques might be optimal for very curious learners but of doubtful value for very anxious learners.

PROGRESS: An attempt was made to analyze the data using a multivariate analysis of covariance technique.

MAJOR FINDINGS: Unfortunately the data were badly skewed. Many subjects under each teaching method were unable to respond correctly to the criterion tests. In general, the expected interactions between motivational style and teaching method were not found. An attempt will be made to replicate the study using a sample of middle-class, academically-able high school students.

Cognitive and Affective Dimensions of Differential Achievement on Open and Closed Book Achievement Tests (599-56)

Mr. Marco

PURPOSE: To reanalyze data regarding differences between open- and closed-book tests on selected cognitive and affective dimensions.

PROGRESS: Tests of hypotheses concerning the effect of open-book testing have been made. However, an equating problem has stymied relating differences between test modes to cognitive and affective variables.

National Council of Teachers of English Literature
Appreciation Test "A Look at Literature" (610-6)

Mr. Ironside

PURPOSE: To develop, as a joint effort by ETS and NCTE, criterion measures of critical reading and appreciation of literature in grades 5 and 6. Specifications include: m/c items, use of excerpts, coverage of several literary types, employment of three response modes, omission of literal comprehension items, oral and silent administration, no time requirements.

PROGRESS: Two final forms of "A Look at Literature" (50 items each, with one-half of test administered orally) were administered in May 1968 to 1040 fifth-graders. Item analysis, form-equating, test analysis, and relationship of performance to general reading levels have been completed. These have been incorporated into the Handbook along with substantive sections concerned with the following: description of the instrument, development of the instrument, limitations, interpretation of test outcomes, and specific suggestions for use of the instrument in both research and instruction. The tests and Handbook have been published and are available through CTS; beyond these there was no formal report.

Selection of MBA Candidates for Later Job Effectiveness
(ATGSB, 690-1)

Mr. Harrell

PURPOSE: The ATGSB Policy Committee provided support for the initial phase of a seven-year study by Thomas W. Harrell, Professor in the Graduate School of Business, Stanford University, to investigate the question: To what extent can students with management potential be identified prior to admission to a graduate school of business? His stated objective was to improve admissions procedures to select students who will not only complete the academic program successfully but will be effective in later business careers, by attempting to identify and measure characteristics which may relate systematically to measures of job effectiveness or success. He proposed to follow up five years after graduation MBA graduates at Stanford, by questionnaire and interview. In the phase supported by the program 64 men from the class of 1961 and 104 from the class of 1962 were included. All of these men had taken a series of tests and responded to various questionnaire-type instruments while they were in school.

PROGRESS: The initial follow-up phase was completed in 1967 and a report was submitted to the Research and Development Committee of ATGSB. ATGSB Brief No. 1, published early in 1969, describes the nature of the overall study and the methodology, as well as preliminary findings and implications. Professor Harrell is continuing the study with other support.

MAJOR FINDINGS: Because of the many uncontrollable, situational variables involved and because of the constantly changing needs of management, the author suggests that high predictability of job success may never be achieved. The study yields few statistically significant relationships, and these are small. There were 58 possible predictors, including 42 scores from a test battery and 16 others. Other than the scores from the test battery, significant relationships beyond chance can be observed as follows: Undergraduate grade point average was positively related to starting compensation and present compensation, but not to perception of job success. Although business school grades were not related to any job criteria for men in large companies, they were related significantly to perception of job success for men in small companies. ATGSB quantitative scores were significantly related to starting compensation for men in large companies but not for those in small companies. ATGSB scores, both verbal and total, were related negatively in small degree with hours per work week, and to a higher degree negatively beyond chance for men in small companies.

The greatest number of predictors were related to the criterion of Position Concern, including a positive relationship with ATGSB scores. Significant relationships were found for those in large companies with such predictors as business school grades, offices held as undergraduates, breadth of business interest as shown on the Strong Vocational Interest Blank, and the Individual Background Survey. For those in small companies, the most significant predictors were need for achievement and authoritarianism.

Criterion Study (ATGSB, 690-5)

Mrs. Crooks

PURPOSE: Most evidence indicates that aptitude and achievement measures are the best predictors of academic grades and that the addition of non-cognitive measures to the predictor battery produces only moderate increments in the accuracy with which grades can be predicted. If more comprehensive criteria could be developed, however, there is reason to believe that non-cognitive data might contribute substantially to prediction. The purpose of this study is to develop criterion measures aimed at qualities other than or in addition to grades which graduate schools of business desire in their graduates and which may be related to later career progress. A variety of predictors, including noncognitive data such as biographical information in addition to measures of aptitude and achievement, could then be studied in terms of their relative contributions to the prediction of each of the several criteria of business school performance.

PROGRESS: Phase I of the study, completed in May 1965, involved the determination of qualities to be evaluated, the development of rating scales anchored by behavioral descriptions, and pretesting. Phase II, completed in 1967, involved the development of a biographical data form, a pilot study in two graduate schools of business of the BDF and the rating scales, analyses of the data, and preparation of a report. Phase III, completed in 1969, involved revision of rating scales and the BDF and a further study of data obtained from 11 graduate schools of business. Double faculty ratings were obtained on a total of 192 students and single ratings on an additional 119 students on seven scales selected as most reliable and least correlated with grades on the basis of findings in Phase II, and second year cumulative grades were also furnished. Predictors used were biographical data, undergraduate grade point average, ATGSB part and total scores, and an index of quality of the student's undergraduate college. Regression analyses of the predictors against the separate criteria of grades and rating scales and a combined criterion were carried out. A cross-validation, with the back sample consisting of the 192 students with double ratings and the cross-over sample including the students with single ratings was carried out.

MAJOR FINDINGS: In Phases I and II selected rating scales were found to be reliable and to provide information not reflected in grades about students' personal characteristics or qualities. The BDF proved to be a satisfactory instrument for research, with selected data related in significant ways to grades and to ratings. The results in Phase III show that selected biographical data do contribute to prediction not only of ratings of personal qualities deemed important to performance in graduate schools of business but also to prediction of grades and to a combined criterion. The comprehensive criterion of performance composed of some proportion of grades and ratings of personal characteristics appears to be a workable concept and is predicted by a mix of academic and biographical variables. The predictors identified in the preliminary analysis and found to hold up in cross-validation deserve further study. The sample in Phase III was smaller than planned in the design of the study because of the difficulty of securing faculty cooperation in providing the ratings, and the findings must be interpreted and applied with caution.

A number of possible outcomes of the study are described in the report, together with implications for future research. Phases I and II are described in RB-70-3 (Thomas L. Hilton, Lorne M. Kendall, and Thomas B. Sprecher). Phase III is described in ATGSB Research Bulletin No. 2 (Lois A. Crooks). A proposal has been made for a feasibility study for Phase IV, in which the student sample in Phase II will be followed up five years after graduation.

ATGSB Grade Grouping Study (ATGSB, 690-8)

Mr. Boldt

PURPOSE: There is rather widespread dissatisfaction with the grade point average as an evaluation of academic performance. One aspect of this dissatisfaction is that courses are included that require a variety of abilities and achievements to the extent that the grade point average is a conglomerate. The purpose of this study is, on a pilot basis, to detect through factor analytic means groups of courses in which students achieve approximately the same relative standing. If groupings are achieved which eventually prove to have generality across schools, the relationship of grades in a group with test scores will provide a sharper interpretation of the scores.

PROGRESS: Transcripts from graduating classes from two graduate schools of business have been obtained as have the ATGSB scores. Punched card records of the transcripts have been made and the data have been analyzed.

MAJOR FINDINGS: Only one factor was required to account satisfactorily for the observed course grades. Scores on the factors correlate best (and almost entirely) with ATGSB-Q. The level of the correlation is about the same with ATGSB-Q whether the factor score or the grade point average is used. There was no marked tendency for verbal courses and quantitative courses to be distinguished.

ATGSB New Item Type Research (ATGSB, 690-11)

Mr. Carlson

PURPOSE: The study is concerned with investigating the validity of three new item types for predicting success in graduate study in business. The three item types are as follows: (1) Common Word requires an individual to summon up associations for three words and then find the one associated word that is common to all three. (2) For Quantitative Comparison the candidate is required to indicate which of two quantities is greater, or to assert their equality, or to assert the lack of sufficient data to reach a judgment. (3) For Practical Business Judgment the first section is in the form of a reading passage which contains information concerning the immediate objectives of a business executive and the various alternative actions by means of which those objectives might be attained. In the second section, data evaluation, the candidate is asked to classify certain of the facts presented in the problem; and in the third, the data application section, the candidate must answer questions that require him to analyze the alternatives available to achieve the stated objective.

PROGRESS: The three new item types were administered in September 1969 to 836 entering first-year students at six graduate schools of business. Score distributions and correlations among the scores have been run for each of the participating schools. Item analysis was run on all items for the total sample.

The second phase of the study was begun in the Spring of 1970, at which time data-collection rosters were sent to each of the schools in order to gather identification information such as ATGSB test scores, FYA, UGR, and dropout data for each student.

Following the analyses, reports will be written for the participating schools individually, and for the validity study over all six schools.

Discrepant Predictors Study for the Admissions
Test for Graduate Study in Business (ATGSB, 690-21)

Mr. Boldt

PURPOSE: Though there is a tendency for indicators of academic potential to agree, it is only a tendency governed by loose statistical rather than deterministic laws. Thus the admissions officer is faced with conflicting evidence about the ability of the candidates among whom he must choose. These conflicts are equally encountered by the executor of validity studies who has to develop a predictive system that yields a prediction no matter what configurations of test scores and undergraduate grades are encountered. The purpose of the study was to test whether the solution adopted for validity studies is adequate and could, therefore, be used by the admissions officer.

MAJOR FINDINGS: UGR's and ATGSB Verbal and Quantitative scores of students at twelve American schools of business were obtained, as were their first year business school averages. Only data for full time day students were used and analyses of covariance carried out for each school separately. The analyses attempted to detect additive bias in the errors of prediction when the predictors agreed, as opposed to when they disagree. The components of variance tested were the three main effects and four interactions that can be isolated in a three treatment complete factorial experiment. Of 84 significance tests, no more exceeded the usual, required levels than would be expected by chance. Analysis of the cell variances revealed that though the spread of scores around the predicted scores is smaller when the predictors agree than when they do not, the differences are not large, being at most approximately .03 on a 4-point scale. In general, indications are that the regression equations used in validity studies work reasonably well and can be used to resolve the conflicting information with which the admissions officer deals.

The study has been completed. A report was submitted to the ATGSB Research and Development Committee in March 1969 and published as ATGSB Brief #2 in June 1969.

In-Basket Study (ATGSB, 690-22)

Mrs. Crooks

PURPOSE: One of the problems in graduate business school admissions is that of reaching decisions on which applicants to admit from the marginal candidates, i.e., those candidates whose ATGSB scores, undergraduate records, and other available comparative data place them in the lowest category of possible admits but in larger numbers than places are available. A related problem is selecting candidates who not only will be able to complete the academic program successfully, but will also have the attributes to be effective in their business careers. Follow-up studies of MBA graduates have shown little or no relationship between grades as a measure of performance in business school and later career progress, although admissions criteria used at present do predict grades moderately well. It was proposed that an in-basket test, a simulation of a management job with its related problems, be administered to a sample of entering MBA candidates at several schools. The question to be answered is whether performance on such a test is a differential predictor, not only of grades but of personal characteristics as measured by faculty ratings. There is research evidence that performance on such a test is related to progress in management. This study is being funded by the ATGSB Policy Committee.

PROGRESS: The Consolidated Fund In-Basket Test was administered to 260 entering MBA candidates at five schools early in the fall 1969 term: the University of Michigan, the University of Pittsburgh, Rutgers, Washington University (St. Louis), and the University of Washington. Also administered were a biographical data questionnaire, the Myers-Briggs Type Indicator, and the Ghiselli Self-Description Inventory. Faculty ratings were obtained on seven scales developed for the Criterion Study (ATGSB, 690-5), and schools have been asked to furnish undergraduate average, ATGSB scores, and grade point average at the end of the first year. The in-baskets and questionnaires have been scored and the results have been reported individually to participating students. Analysis of the data will be carried out in the fall of 1970.

The Moderating Effect of TOEFL on ATGSB (ATGSB, 690-23)

Mr. Sharon

PURPOSE: Foreign students desiring to enroll in American business schools are frequently examined with both the Test of English as a Foreign Language (TOEFL) and the Admissions Test for Graduate Study in Business (ATGSB). No information is presently available as to whether TOEFL adds to the predictive validity of the ATGSB for foreign candidates. The two tests will be combined through nonlinear regression to predict first-year grade-point average. It is hypothesized that ATGSB will be found to be a valid predictor only for those who score high on TOEFL.

PROGRESS: Seven graduate business schools provided ATGSB and TOEFL scores and grade-point averages for a total of 107 of their foreign students for whom these data are available. The data were analyzed and a draft report has been submitted to the ATGSB R&D committee for review.

MAJOR FINDINGS: The original hypothesis of the study was not put to a test because the student sample was a highly selected one, the average TOEFL score being at the 81st percentile on foreign student norms. The data were pooled across schools for regression analyses by means of the central prediction system. ATGSB was found to be a much more valid predictor of GPA than was TOEFL. The validity of the ATGSB was not significantly improved when this test or its parts were combined with TOEFL in a linear or nonlinear fashion.

ATGSB Speededness Study (ATGSB, 690-25)

Mr. Evans

PURPOSE: The purpose of this study is to determine if Quantitative sections of ATGSB are more speeded for minority group candidates than for white candidates. Special forms of ATGSB will be developed for administration to predominantly black groups and predominantly white groups in 1971.

PROGRESS: The project is presently in the test development stage.

School Readiness Criteria Study (699-1)

Miss Anderson

PURPOSE: The study is designed to identify what the expression "ready for school" means as used by those most closely associated with first graders.

PROGRESS: Teachers provided readiness ratings for pupils and critical incidents illustrating the basis for each rating; a panel of consultants defined goals of preschool education; and child development psychologists met to define what they mean by "ready for school." The report is being written.

MAJOR FINDINGS: Preliminary study of the data shows the teachers tend to define "ready" on cognitive bases, "not ready" for emotional or physical reasons.

Longitudinal Study of Early Predictors of Creative
Achievements (711-2)

Mr. Evans

PURPOSE: This study is investigating whether measures of student ability, interest, and achievement in grades 7, 9, 11, and 12 can predict IAQ scores at the end of grade 12.

PROGRESS: Relatively complete data have been collected on over 2,000 students. These data have been examined to determine the relative effectiveness at different points in time of various measures in predicting IAQ scores.

Five criteria of creativity have been examined. Correlational analyses indicated: (1) the best predictors of creative achievements were past creative achievements; (2) 7th grade academic skills also correlated significantly with the criteria; (3) the combination of past achievements and academic skills predicted IAQ scores quite well; and (4) the particular criterion area (e.g., science vs. art) and the students' sex moderated the magnitude of the foregoing relationships.

A report of these results was presented at the 1969 meetings of the American Psychological Association.

College Student Questionnaires Project (713)

Mr. Centra
Mr. Hartnett

PURPOSE: The College Student Questionnaires are biographical and attitudinal questionnaires that have been developed for use by institutional research persons in describing groups of students for a variety of research purposes. The current Form 200D is being distributed under the auspices of ETS's Institutional Research Program for Higher Education.

PROGRESS: In the past year, three studies have been undertaken using accumulated data.

(1) College Freshman Attitudes toward Cheating. The purpose of this study was to study characteristics of students with lenient attitudes toward cheating and to identify the types of colleges that tend to enroll these students. The student sample consisted of 1500 entering freshmen at 37 colleges, while the analysis by type of institution was conducted with 119 colleges and universities. Students with lenient attitudes toward academic cheating shared similar attitudes about cheating in government and industry. Furthermore these students, compared to other students, tend to be less academically motivated, have fewer artistic-literary interests, and come from lower socioeconomic backgrounds. Institutions that enrolled students with strong attitudes against cheating, and thus provided less of a climate for cheating, were generally more selective, all-female, and small in size. These same types of institutions, according to previous research, have lower cheating rates. Reported as a Research Bulletin (69-24). (Mr. Centra)

(2) Birth Order and Family Size: Variables in Describing Attitudinal and Personal Characteristics among College Freshmen. Previous birth order research has seldom focused on such attitude measures as Family Independence, Peer Independence or Motivation for Grades (all CSQ-1 scales). The purpose of this study is to investigate these and other characteristics of only, oldest, in-between, and youngest children. Family size, often neglected as a variable in previous research, will also be taken into account.

A multiple-discriminant analysis of nine groups based on ordinal position and family size is now under way. (Mr. Centra and Mr. Hartnett)

(3) Differences in Selected Attitudes and College Orientations between Black Students Attending Traditionally Negro and Traditionally White Institutions. The purpose of this research was to examine certain attitudinal characteristics of black collegians (entering freshmen) who attend traditionally Negro colleges and universities and to compare the profile thus obtained with that of black students attending integrated institutions. Particular interest was to focus on levels of family and peer independence and educational and occupational aspirations (CSQ-1).

This study has been completed and a report is available (RB-69-48).

MAJOR FINDINGS: Black students entering integrated institutions were found to have higher SAT-V scores, to be more independent, liberal and concerned with social injustice, and to aspire to more years of formal education. Many of the attitude differences between the two groups, however, were found to be highly correlated with SAT scores. Thus, to the extent integrated institutions are attracting the higher ability (as measured by the SAT) Negro students, they are also attracting those with a quite different set of attitudes, background characteristics, and orientations toward college. (Mr. Hartnett)

A Study of Academic Prediction and Growth in
Grades 5 through 12 (719-1)

Mr. Hilton
Mr. Godwin
Mr. Werts

PURPOSE: This is a longitudinal study to determine how academic growth is related to characteristics of the school and to characteristics and experiences of the students.

PROGRESS: The sample of schools, which was selected on the basis of region of the country, size and location of school, and number of graduates who go on to college, consists of 27 public high schools and their junior high and elementary feeder schools and six independent preparatory schools for boys. The School and College Ability Test (SCAT), the Sequential Tests of Educational Progress (STEP), and the Test of General Information (TGI) were administered in the fall of 1961 to about 30,000 students in grades 5, 7, 9, and 11. The SCAT and STEP score distributions were obtained separately for high, middle, and low college-sending schools and for the six independent schools.

College Board Achievement Tests in American History and English Composition and the Preliminary Scholastic Aptitude Test (PSAT) were administered to about 6,000 twelfth-graders in January-February 1963. The seniors also completed a Background and Experience Questionnaire (BEQ). Follow-up information about the high school graduates and the dropouts has been obtained. In the fall of 1963, SCAT, STEP, and TGI were administered to about 33,000 students in grades 7, 9, and 11; in addition, grades 7, 9, and 11 completed a BEQ.

In the winter of 1963, the testing plan of January-February 1963 was repeated for the second group of students to become seniors. In the fall of 1965, grades 9 and 11, the original grades 5 and 7, were tested for the third time. The third wave of senior testing took place in January-February 1967. These seniors were the original grade 7. In the fall of 1967, the original fifth-graders were tested as eleventh-graders. The final senior testing took place in January-February 1969.

Numerous studies have now been completed. An annotated bibliography of Growth Study publications is available (PR-69-11).

Seven studies completed within the past year or in progress are described elsewhere in this "Report on Research Activities at ETS": the home environment study (719-6), the longitudinal item response study (719-9), the SES and academic gain study (719-2), an investigation of alternate methods of analyzing school effects (719-4), a pilot study of a new technique for the analysis of multivariate change (719-15), a study of the factor structure of the STEP tests (719-3), and a study of the effect of enrollment in math courses on achievement in mathematics (719-13). In addition, a number of studies based on Growth Study data are described elsewhere in this report (Study of Vocational Development 870-1).

Socioeconomic Status and Academic Gain (719-2)

Mr. Hilton
Miss Cobes

PURPOSE: To test three hypotheses derived from Bloom:

- I. Gain in achievement varies directly with the SES of the student's parents.
- II. For a given SES group, gain in achievement in a given time period will be independent of level of achievement at the beginning of the period.
- III. The variance of gain scores in achievement for groups heterogeneous with respect to SES will be significantly greater than the variance for subgroups which are relatively homogeneous with respect to SES.

PROGRESS: Gain in achievement in reading and mathematics, as measured by STEP, from grades five to nine, was examined for three SES groups, as measured by parents' education and occupation. The sample was divided by sex and was replicated in three U. S. school systems. A total of approximately 1400 students was drawn at random from the file of the Growth Study (see 719-1).

MAJOR FINDINGS: Test of the mean gain scores and correlations from grades five through nine for boys and girls provided no support for Hypothesis I. Correlations between initial and gain scores indicated no significant relations between gain and initial scores in reading or mathematics achievement for any SES groups. When separate tests were used for the initial measure, however, Hypothesis II was rejected for mathematics but not for reading.

Using Bartlett's Test for the difference in variance of gain scores, no generalizable results in support of Hypothesis III were found for either reading or mathematics achievement. A report is in preparation.

SCAT-STEP Factor Structure (719-3)

Mr. Jöreskog
Mr. Berglund

PURPOSE: To investigate stability and change over time of factor structure of SCAT-STEP tests, for the total Growth Study sample and separately by sex.

PROGRESS: A number of alternate factorial models are being fitted to the six test scores on four occasions: Grade 5, Grade 7, Grade 9 and Grade 11. Being taken into consideration are general factors across all tests, factors specific to individual tests across occasions, and factors specific to individual occasions. Some results are presented in RB-69-62.

Investigation of Alternate Methods of
Analyzing School Effects (719-4)

Mr. Werts
Mr. Linn

PURPOSE: A number of different statistical models for analyzing school effects have been proposed in the past including multiple regression, multiple partial regression, analysis of covariance, path analysis, and various estimates of change. The purpose of this study is to identify the basic differences among the models, as well as the similarities, and especially to ascertain what implications the models have for the study of academic growth.

PROGRESS: The project was terminated with the publication of:

Linn, R. L. & Werts, C. E. Assumptions in making causal inferences from part correlations, partial correlations, and partial regression coefficients. Psychological Bulletin, 1969, 72, 307-310.

Werts, C. E. & Linn, R. L. A general linear model for studying growth. Psychological Bulletin, 1970, 73, 17-22.

MAJOR FINDINGS: The most important finding was that the different statistical procedures in use for analyzing school effects are not in fact equivalent and should not be used to analyze the same problem. Rather, as demonstrated in the above papers, the appropriate approach depends on the nature of the theory being tested.

Home Environment and Educational Development
(719-6)

Mr. Hilton
Mr. Lantz
Miss Patrick

PURPOSE: Recent studies have indicated the importance of process variables in the home as predictors of academic status. This study is an attempt to determine the relationship between students' perceptions of process variables in the home and their academic growth. The measures of academic growth are the STEP, SCAT, and TGI. Students' perceptions are derived from BEQ responses.

PROGRESS: Data relative to students' socioeconomic status and perception of family environment for a group of subjects from the Growth Study population have been examined.

A scale made up of those BEQ items related to students' perceptions of family environment was developed and tested for internal consistency. After some revision, scale scores were computed for a segment of the Growth Study sample. These scores along with mathematics achievement at Grades 5, 7, 9, and 11 and curriculum anticipated at Grade 7 or enrolled in at Grades 9 and 11 are currently being investigated by means of path analytic techniques.

Longitudinal Study of Item Responses (719-9)

Mr. Benjamin

PURPOSE: Richard Benjamin, a participant in the 1967 Summer Graduate Student Program, is using Growth Study data to complete a longitudinal study of item responses. Three Growth Study schools in Oakland, California, were tested with STEP Reading, form 3B, in both 1963 and 1965. By developing an experimental form of STEP Reading which contains half of form 3B and half of form 2A (the proper form for eleventh-grade students), he will be able to study the item responses of the same students on three occasions over a six-year period. Benjamin's objective is to test a model for the distribution of distractor response frequencies proposed by Frederick Kling.

PROGRESS: An experimental form of STEP Reading called form 2X was developed, printed, and administered during the Growth Study testing in October 1967. Two-thirds of the students in the three Oakland schools took the experimental test. Item responses for students tested in 1963 and 1965 have been retrieved from the Growth Study files.

Growth as a Function of the Amount of Training
(719-13)

Mr. Hilton
Mr. Berglund

PURPOSE: To study the growth of two variables (STEP Mathematics and SCAT Quantitative) in relation to the amount of training in math given during the time period to be studied, i.e., between grade 5 and grade 11.

PROGRESS: Trend lines based on the mean test performance of students exposed to different amounts of math instruction have been obtained for the total Growth Study sample and separately by sex, by school, and by curriculum. With one major exception (the group of students reporting the most exposure) the trend lines were as predicted. A number of possible explanations for the unexpected performance of the "high exposure" group have been investigated, the most likely appearing to be that the responses of the "high exposure" group are not valid. This hypothesis is being checked by means of a specially constructed response bias scale for the BEQ.

MAJOR FINDINGS: As early as the 5th grade the math achievement of students who select more math courses in high school is superior to the achievement of those who elect fewer courses. Generally, growth in math achievement is positively correlated with exposure although not as strongly as predicted.

Multivariate Change Pilot Study (719-15)

Mr. Beaton
Mr. Hilton

PURPOSE: A technique for longitudinal multivariate analysis is being tried out on a subsample of Growth Study subjects using a selected set of measures and biographical information related to science achievement.

PURPOSE: A computer program for exploring the model has been developed and tested on a number of theories of growth. The model produces parameter estimates, model fits, and estimates of the net effect of variables in complex domains.

MAJOR FINDINGS: The preliminary results indicate a particularly effective way of studying complex growth processes.

The Executive Study (732, All Jobs)

Mrs. Crooks

PURPOSE: The Executive Study is a general project initiated in 1955 to encompass basic research on executive performance, selection, and development.

PROGRESS: Early projects and research carried on under this heading (Harbets, Team Coordination, Engineering Study, Executive Position Description Questionnaire, Group Dimensions Questionnaire, etc.) have terminated, but inquiries continue to be received with regard to methodology, findings, instruments used, and research going on elsewhere.

Executive Study Conference: On January 1, 1970, the Executive Study Conference was incorporated by the members and will be administered by its officers and an Executive Committee. ETS has become a regular member. This association of companies holds two conferences a year to discuss research being carried on at the management level in selection, development, and training. The conferences in 1970 are structured around Job Enrichment and Organization Development.

Executive Study Conference reports: All reports published of proceedings of conferences prior to December 31, 1969 are available from ETS at \$10 per copy. A list of the reports is available on request.

In-Basket Development and Research (735, All Jobs)

Mrs. Crooks

PURPOSE: This is a general project to include research and development on the in-basket technique and the application of such instruments for various purposes.

PROGRESS: Consolidated Fund In-Basket Test: This in-basket, in which the setting is a community fund in which the subject assumes the role of the paid director, continues to be used in various training, research, and assessment situations. This is the only in-basket exercise currently available at ETS for purchase and use by outsiders. Scoring must be done by trained scorers. The Public Service Commission of the Canadian government is currently using this in-basket in a research study with their Career Assignment Program. Scoring is being done at ETS. Characteristics of their sample are being studied in relation to other samples from our files, including middle management in business and MBA candidates.

Senior Management In-Basket, Public Service Commission of Canada: An in-basket test at the senior management level is being developed to be used with other measures in assessment programs in departments and agencies of the Canadian government. The programs will attempt to identify present staff members with potential for the senior management level. Interviews with senior managers, time and activity logs kept by their secretaries, and administration of the Executive Position Description Questionnaire to all senior managers will provide communalities for a model of the senior management job to be simulated. A committee of senior managers will advise on the project.

Perceptual Factors in Cognition and Personality
(ONR, 741-10)

Mr. Messick
Mr. French

PURPOSE: This study investigates factor analytically the generality in cognitive and personality domains of the perceptual factors of speed and flexibility of closure.

PROGRESS: Experimental tests of verbal and cognitive closure and flexibility in reasoning and problem solving were developed and included in a test battery with selected personality and reference ability measures. The test battery was administered to more than 500 cadets at the U. S. Naval School of Aviation Medicine, Pensacola, Florida. A factor analysis of inter-correlations among 35 scores on perceptual and cognitive tasks has produced about 14 factors, which were rotated to oblique simple structure. Twenty scores from personality measures were also projected into the space by extension methods. Examination of the results indicated factors interpretable in terms of speed and flexibility of perceptual closure, of verbal closure, and of cognitive closure. Intercorrelations among the primary factors were factor analyzed to produce four second-order factors. A hierarchical transformation was performed to place the first- and second-order factors in the same orthogonal framework and to obtain the loadings of the tests on the second-order factors. The second-order factors appear to reflect verbal comprehension, general reasoning, figural articulation (i.e., facility in structuring and differentiating figural stimuli), and symbolic articulation. A report has been completed and will appear soon as a Research Memorandum.

Accuracy of Estimated True Scores (ONR, 746-3; 746-4)

Mr. Lord
Mrs. Hamilton

PURPOSE: To investigate the accuracy with which the true scores of examinees can be estimated from their observed scores, using a nonlinear regression line.

PROGRESS: A mathematical formulation was developed based on a binomial error model. A computer program has been written to carry out the necessary computations.

Estimating Item Parameters (ONR, 746-3; 746-4)

Mr. Lord
Mrs. Wingersky

PURPOSE: To find a practical method to estimate the parameters of the item characteristic curve of each item in a given test.

PROGRESS: A maximum-likelihood method has been devised and a computer program has been written and debugged. At present, the iterative computations do not always converge.

The Self-Scoring Flexilevel Test (ONR, 746-3; 746-4)

Mr. Lord

PURPOSE: To develop a test that adjusts the difficulty of the items administered to the ability level of the examinee without the complications usually involved in tailored testing.

PROGRESS: An effective procedure was devised for doing this. Test administration is fairly simple, although the test answer sheet and the directions given to the examinee are more complicated than with an ordinary test. A simple number-right score is satisfactory.

Strong True-Score Theory (ONR, 746-3; 746-4)

Mr. Lord
Mrs. Wingersky
Mrs. Hamilton

PURPOSE: The purpose of this project is to find a mathematical model for the details of the relation between true score and observed score, fitting a wide range of ordinary test data, so that one can estimate or predict in advance the mental test performance of groups of examinees in ways not previously possible.

PROGRESS: A report has been published in the 1969 Psychometrika describing a method for estimating true-score distributions; also some of the empirical results obtained.

MAJOR FINDINGS: The available computer program is judged ready for practical applications. For example, it can be used to estimate national norms for a test when only a short form can be administered to the norms sample.

Two-Stage Tests (ONR, 746-3; 746-4)

Mr. Lord
Mrs. Hamilton

PURPOSE: A two-stage test consists of a routing test followed by one of several alternative main tests. The purpose of this study was to find good designs for two-stage tests.

PROGRESS: Some 200 different designs were tried out, using computer methods based on test theory.

MAJOR FINDINGS: When there is no guessing, two-stage testing may be as effective as the best practical tailored testing procedures.

On the Sampling Theory of Reliability Estimation
(ONR, 746-3; 746-4)

Mr. Kristof

PURPOSE: The paper is intended as a contribution to the sampling theory of reliability estimation when a test has been divided into two, not necessarily parallel, parts.

PROGRESS: A report of the work is contained in RB-69-36, which has been accepted for publication by the Journal of Mathematical Psychology.

MAJOR FINDINGS: Under normality assumptions, a strict t-test of a point hypothesis about the coefficient alpha parameter is derived. The test is then converted to yield confidence intervals for alpha. These techniques remain applicable even when the initial distributional assumption is considerably relaxed. The methods developed here are complementary to the large sample techniques reported in RB-69-25. Worked examples are appended by way of illustration.

Statistical Methods in Personnel Selection, Evaluation,
and Guidance (ONR, 749-1; 749-2)

Mr. Novick

PURPOSE: The technologies of test validation and of selection, evaluation, and guidance have benefited from more than 50 years of continuous development. A highlight of this development was the major synthesis of this area contained in R. L. Thorndike's Personnel Selection published soon after the close of the second World War. Since that time many important contributions have been made in these areas. Of particular importance are Horst's Monographs on Multiple Differential Prediction and Multiple Absolute Prediction, and Tucker's Monograph on Central Prediction. However, before any new synthesis of the field can be attempted certain important technological problems need to be solved.

The first of these involves the so-called "correction for restriction of range." Since validity coefficients are strongly affected by selection within a group and since unselected groups are almost never available for validity and prediction studies it is essential that an accurate correction for this selection be available. The often used corrections based on work originally done by Karl Pearson are based on untenable linearity and homoscedasticity assumptions. While work by Rydberg and others has shown that these corrections are better than none, it has been generally believed that these corrections have a tendency to undercorrect in many applications. Also, very little is known about the accuracy of these corrections when the amount of selection has been quite drastic, for example, when only five or ten percent of an applicant group is selected. One task of this project will be to undertake empirical and theoretical studies to determine the accuracy of the presently available corrections under extreme selection and to provide more reasonable and more accurate theoretical models and to demonstrate the accuracy of these new methods on data.

In typical applications of regression theory it is standard practice to estimate the slopes and intercept of the linear regression equation and to substitute these estimated values for the unknown parameters and thus to write a linear prediction function which is then used for predictive purposes. This linear prediction function will, of course, almost certainly not be identical with the true linear regression function. The problem is further complicated when the total population can be broken down into subpopulations and where the true regression functions in the subpopulations do not coincide. Statistically this problem finds its explication as a problem of prediction in future samples. An attempt will be made to extend Bayesian prediction theory to this problem. If successful this would provide an improved (and perhaps, in some sense, optimal) method both for specifying linear prediction functions and for selecting optimal subsets of predictor variables.

If the necessary extension of this theory can be obtained, an application can also be made to certain problems in selection and guidance. In particular these methods could provide improved selection models for accepting systems, guidance models for sending systems, and their union, an improved central prediction model.

PROGRESS: Since this project has a very applied orientation, much emphasis will be placed on the development of operational computer programs. A description of a Predictor Variable Prediction System developed by Thayer and Novick appeared in the Autumn 1968 issue of Educational and Psychological Measurement. This computer system provides subroutines for performing standard regression analyses and for performing the optimal time allocation algorithm developed by Woodbury and Novick. An updated program for the IBM 360 and including both the Woodbury-Novick and Jackson-Novick procedures appears as RB-69-50 by Thayer and Novick.

Some empirical work has been undertaken to compare the efficiency of the unit-weight time allocation procedure developed by Jackson and Novick in RB-69-14 (scheduled for publication in Psychometrika) with the regression weight time allocation algorithm developed by Woodbury and Novick. It is found that typically nearly as satisfactory results can be obtained with the former as with the latter but quite different allocations are required depending on the kinds of weights being used. A report on these findings entitled Some Applications of Procedures for Allocating Testing Time appears as RB-69-1. A survey of the "Bayesian Guidance Technology" appears as RB-69-83 and will appear in the October 1970 issue of the Review of Educational Research.

Dimensions of Perceived Item Similarity
(USPHS, 752-2)

Mr. Messick

PURPOSE: To ascertain the number and nature of dimensions of perceived similarity among personality statements (in terms of similarities in likelihood of endorsement) in an effort to appraise the relative contributions of perceived content consistencies and perceived desirability consistencies in determining judgments of endorsement frequency.

PROGRESS: Twenty-three MMPI items were selected to span six dimensions previously obtained in analyses of MMPI responses. All possible pairs of these 23 statements were presented to 150 college students, who were asked to rate the similarity of the members of each pair with respect to their probability of endorsement. The 150 x 150 matrix of sums of cross-products among individuals was computed and factored according to the individual differences model of multidimensional scaling. Four dimensions of viewpoint about the similarity of these items appeared, and separate multidimensional spaces were derived for each viewpoint. These perceptual spaces were rotated orthogonally, and the dimensions were interpreted. One important distinction reflected in most of these spaces is the separation of desirable from undesirable item content. A report is in preparation. (Study done in collaboration with Dr. D. N. Jackson of the University of Western Ontario.)

Judgmental Dimensions of Desirability and Frequency of
Occurrence in the Prediction of Response Factors
(USPHS, 752-2)

Mr. Messick

PURPOSE: To distinguish among judgments of (1) desirability, (2) frequency of occurrence, and (3) frequency of endorsement, and to assess their relative contributions in predicting scale loadings on the largest MMPI factor.

PROGRESS: Judgments of the actual frequency of occurrence of the characteristic described in each of the 566 MMPI items were obtained from 56 college students. Fifty-five other college students rated the frequency with which people would admit to each characteristic in describing themselves. Means and standard deviations for each item were tabulated for both sets of ratings, along with successive intervals scale values and discriminial dispersions. Scale values and dispersions for ratings of the desirability of these items were available from a previous study. Also available from two separate samples (normal college students and hospitalized mental patients) were factor loadings for 40 MMPI scales on the largest MMPI factor.

Selected scoring keys were reflected until all of the scales had average desirability values in the undesirable direction. With this consistent scoring rule, the average desirability values for the scales correlated .68 with the factor loadings in the hospital sample and .64 in the college sample. The addition of scale values for judged frequency of occurrence produced multiple correlations of .81 in both samples. The further addition of scale values for judged frequency of endorsement did not increase the multiple correlation further. Average judged frequency of endorsement correlated .94 with actual endorsement frequencies obtained from a sample of 329 college students. A report has been published, "A distinction between judgments of frequency and of desirability as determinants of response." Educational and Psychological Measurement, 1969, 29, 273-293. (Study done in collaboration with Dr. D. N. Jackson of the University of Western Ontario.)

Judgmental Dimensions of Psychopathology
(USPHS, 752-2)

Mr. Messick

PURPOSE: To ascertain the number and nature of consistent individual viewpoints about the desirability of MMPI items and to see if these judgmental viewpoints are reflected in response consistencies.

PROGRESS: Ratings of the desirability of all 566 MMPI items were obtained from 150 college students. On a subsequent day, these subjects also responded to the same items under standard MMPI self-description instructions. The 150 x 150 matrix of sums of cross-products among individuals was obtained and factored. Thirteen dimensions of viewpoint emerged. Item loadings for each consistent viewpoint were computed and rotated to orthogonal simple structure. The obtained dimensions reflected differential viewpoints about such characteristics as religious preoccupation, difficulty with control of bodily functions, denial of femininity, oversensitivity, socially deviant attitudes, self-deprecation, listless distractibility, worry, and harm avoidance.

The items marking each viewpoint were then scored as response keys for these subjects and for another sample of 160 college students. Most of the resulting response scales exhibited significant reliabilities, with five scales having reliabilities in the seventies. The two viewpoints that were not interpretable produced reliabilities below .25. The viewpoint scale interpreted as "denial of femininity" correlated with female sex $-.72$. A report has been completed (RB-70-37). (Study done in collaboration with Dr. D. N. Jackson of the University of Western Ontario.)

Leveling-Sharpening as a Cognitive Style
(USPHS, 754-7)

Mr. Damarin
Mr. McKenna
Mr. Messick

PURPOSE: This research has three major purposes and several minor ones. The first purpose is the replication and extension of earlier findings by Gardner, Jackson, and Messick on the cognitive style of leveling-sharpening. The tests which are involved in this research include many psychophysical measures. A second purpose is to discover whether the leveling-sharpening trait or other psychological traits can serve as the parameters of the psychophysical law, as Damarin has suggested they should. Since many leveling-sharpening measures are similar in their formal structure both to measures of figural aftereffects and to measures of retroactive inhibition, a third purpose of the research is to discover whether "levelers" also show larger FAE's and more retroactive inhibition as McKenna has hypothesized.

PROGRESS: Forty-seven objective tests, including putative measures of leveling-sharpening, field independence, category width, neuroticism, figural aftereffects, retroactive inhibition, verbal satiation, rote memory, memory span, meaningful memory, and psychophysical judgment, and a variety of questionnaires, including most of the known response styles, were administered to 147 freshman men and women at the College of William and Mary in Williamsburg, Va.

MAJOR FINDINGS: In an earlier study, now completed, cognitive style measures showed an impressive ability to predict individual differences in the recall of photographs of human faces, thus supporting assertions to this effect by Witkin (cf. RB-63-21).

A later study developed evidence that several different types of leveling-sharpening may exist. One of these is reasonably similar to the dimension that Gardner and his associates interpreted as the tendency to assimilate perceptions to memories.

The same research yielded evidence that individual parameters of the psychophysical function may correlate over different types of judgments, giving some support to Damarin's "trait law" hypothesis. A more refined analysis of this data is now under way.

McKenna's factor analysis of memory tests suggests that there are memory styles associated with a preference for errors of omission vs. commission. A report on this work is available (RB-68-28).

Personality Organization in Cognitive and Social Processes (USPHS, 754-7)

Mr. Messick

PURPOSE: This project attempted (a) to clarify in a series of multivariate studies the nature of several cognitive styles and to investigate their interrelations with measures of intellectual ability, attitude and belief structures, affect expression and control, academic and creative achievement, and personality; (b) to analyze sex differences in cognitive and personality structure; (c) to assess the stability of cognitive styles and the correlates of reliable changes; and (d) to evaluate the role of cognitive styles in interpersonal and social functioning.

PROGRESS: (a) Categorizing Styles and Cognitive Structure (with Nathan Kogan). This study attempts to clarify two basic questions: (1) Is there a general dimension of breadth of categorization yielding individual consistencies in categorizing behavior across varied stimulus domains and measurement procedures; and (2) what are the cognitive, intellectual, and personality correlates of stylistic consistencies in categorization? Group-administered measures of verbal and quantitative category-width judgments, object sorting, cognitive complexity, preference for complexity, and extremity of judgment were administered to approximately 160 college students, along with several other cognitive, intellectual, and personality variables. Factor analyses were performed separately for male and female subjects. The results indicate that categorizing consistencies exist, but that they are multidimensional and their organization is somewhat different for the two sexes. Females appear to display more generality across categorizing tasks than do males: several dimensions relevant to categorizing emerged for both sexes, but they appeared to be somewhat more differentiated and task specific for males. Personality measures were found to be implicated with categorizing and judgmental consistencies in females, whereas they were more directly associated with intellectual abilities in males. Although the emergence of several categorizing factors in this study indicates the operation of differential stylistic tendencies in this domain, the factors were at the same time found to be correlated with each other, suggesting some generality at a second-order level. Factor analyses of the intercorrelations among the primary factors produced three second-order factors for males and two for females. In both sexes, one of the second-order factors reflected general categorizing consistencies that cut across the stimulus and process distinctions embodied in the various first-order factors:

(b) Cognitive Complexity: Dimensions of Role Constructs (with Nathan Kogan). In conjunction with the study of categorizing styles described above, an attempt was made to assess certain aspects of cognitive complexity using multidimensional scaling techniques. Much recent work on cognitive complexity has used a procedure developed by George Kelly for assessing personal constructs--the Role Construct Repertory Test (Rep Test), in which the subject is presented with several triads of figures significant in interpersonal relations, such as mother, self, and best friend. The subject is then asked to indicate which two members of the triad are most alike and to write down both the basis for their similarity and the reason why the third member is different. The number of different constructs listed has been used as a measure of cognitive complexity.

The 160 subjects in the categorizing study described above were administered a modified form of the Rep Test, and they were also asked to judge on a 10-point scale the degree of similarity or difference between all possible pairs of the 15 role figures. Cross-products matrices for these similarity ratings were computed separately for males and females and were analyzed according to the individual differences model of multidimensional scaling. Six dimensions of viewpoint about stimulus similarity were obtained for the females and seven for the males. The individual scores on these dimensions were then correlated with the cognitive and personality measures included in the categorizing study in an attempt to ascertain some of the properties of individuals holding each viewpoint. In this case, meaningful patterns of significant correlations were obtained between the viewpoint scores and such measures as acquiescence, impulsiveness, rigidity, unconventionality, preference for complexity, category width, and conceptual differentiation.

Two composite stimulus spaces were also derived, one to represent the similarity judgments of the males on the average and one to represent the similarity judgments of the females on the average. For the females, four dimensions were required to represent the average similarity judgments among 15 stimuli, whereas for the males three dimensions appeared adequate. The same three dimensions appeared in both spaces, but the fourth female dimension provided a distinction in sex-role relations (they described similarities between "mother" and "sister" on a separate dimension from similarities between "father" and "brother") that was not emphasized by the males. One report is available and another is in preparation.

(c) Cognitive Interference and Flexible Control. The term "constricted vs. flexible control" refers to consistent modes of reacting to interfering and contradictory cues. This cognitive control has been most frequently assessed in terms of interference scores on the Stroop Color-Word Test. In the present study, a group-administered version of the Stroop Color-Word Interference Test was developed, as well as three other group procedures designed to measure susceptibility to cognitive interference in the face of differing amounts of competing response and at various levels of cognitive involvement. An attempt was made in developing these procedures to vary the ease of separating competing cues in the interference conditions, so as to permit an empirical separation of two related processes thought to be important in withstanding cognitive interference effects: (1) facility in restricting attention to the relevant aspects of the stimulus and the response and (2) facility in actively inhibiting the competing response and other disrupting tendencies. The four tasks were administered to approximately 90 college males, along with the original individually-administered Stroop Color-Word procedure and several other cognitive and personality measures. Both control and interference sections of all five Stroop-type tests were found to correlate highly with each other (median r of .53), but specific processes involved in each task were differentiated in a factor analysis, as were the cognitive and personality correlates of the factors. A factor analysis of intercorrelations among nine first-order factors uncovered two second-order dimensions, which appeared to reflect (1) the ability to withstand disruption in serially organized tasks and (2) the ability to isolate and

identify the appropriate aspects of the stimulus and response. A regressed interference score was also obtained for each of the five procedures to reflect that part of the interference performance which was independent of the control performance. These regressed scores possessed substantial reliability, and although they were not related to each other, they exhibited different patterns of significant correlations with personality measures.

(d) Leveling-Sharpening and Assimilation Tendencies (with Fred L. Damarin and Virgil McKenna). The cognitive style of leveling-sharpening has been postulated to account for consistent individual patterns of performance in psychophysical tasks and in the relative differentiation of free association responses. These cognitive consistencies have been attributed to individual differences in the activity of the memory process of assimilation. Levelers assimilate in the sense that they tend to merge perceived objects or stimulus events with similar but not identical objects recalled from previous experience.

In an effort to clarify possible multiple determinants of leveling-sharpening consistencies, the present study attempted to specify the concepts of assimilation and contrast in many different ways as a basis for developing a variety of new experimental tests.

One procedure that was highlighted finds its prototype in the Schematizing Test, which has been used as a criterion measure of leveling-sharpening in other laboratories. The Schematizing Test provides two scores: a lag score measures the subject's tendency to underestimate change in a series of squares that gradually increase in size, and an accuracy score measures his ability to estimate magnitudes accurately within a fixed range of stimulus values.

By also including tasks with different types of stimuli and different judgmental conditions, the present study focused upon the construct validity of alternative interpretations of leveling-sharpening and assimilation-contrast. A battery of several experimental psychophysical judgment tasks was administered to 150 college students, along with measures of field-independence, category width, figural aftereffects, retroactive inhibition, verbal satiation, memory abilities, and various personality characteristics. A factor analysis produced 17 factors, which were rotated to oblique simple structure. An analysis of the intercorrelations among the first-order factors produced four second-order dimensions. One of the factors could very plausibly be interpreted as a measure of assimilation or dedifferentiation of memory traces over time, but the lag score from the Schematizing Test was not related to it. Another factor appeared to represent uncriticalness in judgment, a general tendency to judge similar stimuli as the "same" as opposed to "different," but again the lag score was unrelated. However, the schematizing score was found to be associated with one of the second-order dimensions, which could be interpreted in terms of leveling-sharpening. One report has been completed (RB-68-28) and another is in preparation.

(e) Tolerance for Unrealistic Experiences (with Norman Cliff). This dimension, also called tolerance for instability, refers to the differential willingness to accept perceptions at variance with conventional experience. The concept was introduced originally to account for data linking form-boundedness and form-lability on the Rorschach with responses to unusual kinds of perceptual experiences, such as those arising in apparent movement and aniseikonic distortion.

The present study attempted to appraise the reliability of several measures of apparent movement and aniseikonic distortion, and to evaluate the intercorrelations among them for evidence of stylistic consistencies. Measures of aniseikonic distortion and perceived range of apparent movement were obtained from a sample of 50 undergraduates. Moderate reliabilities were obtained for certain measures of aniseikonic distortion. High reliabilities were achieved for movement threshold and simultaneity threshold scores in the apparent movement procedure, but the two thresholds correlated positively with each other (.46). Correlations between aniseikonic measures and the movement and simultaneity measures were small, but some consistencies appeared. There was a slight tendency for distortion measures to correlate more strongly with movement thresholds than with simultaneity thresholds, and some distortion measures correlated in the same direction with both thresholds. Taken together, these findings suggest that scores for range of apparent movement reflect, in addition to a willingness to perceive the illusion of movement, a possible assimilation phenomenon in which subjects vary in their tendency to stick with a particular judgment (either alternation or movement) once they have made it.

(f) Scanning and Focusing (with Harold Schiffman, Duke University, and Diran Dermen). The dimension of scanning-focusing refers to individual differences in the extent of spontaneous attention deployment. Extensive scanners tend to search and peruse a field of interest, surveying both relevant and irrelevant or miscellaneous properties. The present study attempted to assess scanning and focusing consistencies in a wide variety of tasks in an effort to obtain some convergence of correlations to clarify the interpretation of the construct. These procedures included perceptual judgment tasks (such as size and distance estimation), perceptual speed tasks, and perceptual search tasks (in which the subject must locate in a larger field stimuli of a particular class). Since scanning propensities may also be reflected in the manner in which internal memory fields are surveyed, measures of fluency of ideational production and remoteness of response in word association were also included. A specific attempt was made to differentiate between two possible types of scanning--scanning for signal detection and scanning for information seeking. This was done using perceptual search tasks in which the subject was required to locate stimuli (signals) embedded in meaningfully organized visual fields, e.g., locating faces camouflaged in pictorial scenes. Upon completion of the search task, the stimulus materials were removed, and the subject was then asked specific questions about the content of the scenes. Subjects who incidentally take in information about the field in the process of scanning could thus be differentiated from those whose concern is apparently limited to detecting the

signal. Measures were also included for facility in detecting signal stimuli in unorganized fields, such as locating four-letter words in arrays of letters. In view of a theoretical and empirical link between scanning and isolation of affect, several tasks yielding measures of affect expression and control were also included, such as early childhood memories, the Holtzman Inkblot Technique (HIT), and a picture preferences procedure that assesses consistent tendencies to like, dislike, or be indifferent to a wide variety of photographs. These procedures were administered to about 100 male and 120 female college students, along with measures of potentially relevant cognitive styles (particularly field independence and category width), intellectual abilities, and personality.

Factor analyses were performed separately for males and females. Although rotations are not yet complete, some striking relations are discernible.

In males, for example, a factor reflecting incidental knowledge of the content of the field was found to be relatively independent of a factor reflecting facility in locating signal stimuli in unorganized arrays; skill in finding faces hidden in organized fields was associated with both dimensions. In females, a factor emerged linking size estimation with form appropriateness and the absence of shading on the HIT, the latter being a traditional Rorschach indicator of conflict about the acceptance of affect. In both analyses, several cognitive dimensions emerged that displayed substantial correlates with inkblot measures and personality scales.

Another feature of this study was an analysis of errors or "wrong" scores, which was undertaken to investigate the possibility that scanners might be differentiated from nonscanners by the type and number of errors they make. Factor analyses of these "wrong" scores revealed several processes that apparently lead to errors on these tasks. These factors include haste and carelessness, intellectual deficiency, premature perceptual closure, impulsiveness, and susceptibility to distracting and embedding contexts.

(g) Cognitive Styles, Defenses, and Eye Movements (with Lester Luborsky, University of Pennsylvania Medical School, Harold Schiffman, Duke University, and Diran Dermen; partly supported by an NIMH grant to Dr. Luborsky).

Extreme scanning has been found by others to be marginally related to ratings of isolation, projection, and generalized delay on the Rorschach (with isolation possibly related to an "information seeking" type of scanning involved in an obsessive concern with exactness to offset doubt and uncertainty, and with projection possibly related to a "signal detection" type of scanning involved in a paranoid concern with accuracy to offset suspicion and distrust). On the other hand, minimal scanning or focusing has likewise been considered to reflect a concern for accuracy and a preference for viewing the world in a narrow discriminating way. The present study attempts to clarify some of these issues by relating measures of scanning and other cognitive styles

(leveling-sharpening and breadth of categorizing) to projective measures of defenses and to characteristic patterns of eye movements in viewing affective and nonaffective stimuli. Heart rate measures of arousal were also obtained under basal control conditions and while viewing the affective and nonaffective pictures.

These procedures have been administered to a small sample of about 40 college students. Several eye-movement scores (such as number of fixations, mean time per fixation, mean track length, and scatter) were obtained for the viewing of each of ten photographs. Heart rate measures were also obtained separately for each photograph presentation. The internal consistency reliabilities of these scores over all ten photographs and over subcategories of photographs reflecting sexual, aggressive, and neutral content have been assessed. Many of the scores proved to be substantially or highly consistent across all of the pictures, but a few were reliable for only one or two of the three subcategories. Such differential reliability was to be expected, since differences in stimulus pattern and meaning should have had more of an impact on some of these scores than on others. The interrelations among eye movement, heart rate, defense, cognitive style, and personality measures have been appraised and a report is in preparation.

(h) Style and Persuasibility (with Fred L. Damarin). This study investigates the interrelations among response styles, cognitive styles relevant to susceptibility to field forces (such as field independence and flexible control), and susceptibility to persuasion and opinion change. A battery of such measures was administered to approximately 90 male college students.

A factor analysis of attitude shift scores, response styles, and selected cognitive and personality measures produced ten factors. Although rotation to oblique simple structure has not yet been completed, preliminary results reveal the presence of four factors clearly related to persuasibility, two of them relatively specific to particular attitude sources and two of them more general in that consistencies are displayed in response to several types of attitude source.

(i) Sex Differences in Cognitive and Personality Structure (with Diran Dermen). This study was designed to bear upon several interrelated questions about the nature and generality of cognitive styles. Of foremost concern were (a) the determination of the number and nature of primary dimensions necessary to account for previously observed stylistic consistencies in cognition; (b) an appraisal of the interrelations of these stylistic dimensions with measures of intellectual ability, attitude and belief structures, affect expression and control, academic and creative achievement, and personality; and (c) an evaluation of sex differences in the psychological organization of cognition and personality.

A battery of experimental measures that required over 20 hours of testing time was administered to more than 700 high school juniors and seniors over a two-month period. The sample included approximately equal numbers of males and females, as well as representatives of college preparatory, commercial, vocational-industrial, and art curricula. High school students were sought for this study because of the extreme difficulty of finding comparable samples of males and females at the college level, i.e., samples where either explicit- or self-selection had not occurred differentially by sex on variables relevant to the sex comparison, not only with respect to obviously relevant variables (like ability patterns and interests) but with respect to more subtle ones as well (like maternal education level). The procedures have been scored not only for the specified dimensions under study, but also for various other response properties (such as number of incorrect or unacceptable answers, number of items omitted, and specific response sets) that would help to characterize the test-taking behavior more completely and might provide important controls for clarifying the basis of some of the obtained relations. Since many of the techniques entailed the evaluation of free responses, the scoring itself was a major undertaking that took more than a year to complete. Reliabilities have been assessed on the total sample and are being appraised separately for male and female subsamples. They have, with few exceptions, proved satisfactory for the total sample. Further analyses are in progress.

(j) The Stability of Cognitive Styles and the Correlates of Change (with Diran Dermen). This study attempts to assess the stability of cognitive style measures over a one-year period and to determine the cognitive and personality correlates of any reliable changes. A sample of 135 high school seniors, who had been extensively tested a year earlier as part of the previous study, were subsequently retested on selected measures of field independence, element articulation, form articulation, conceptual differentiation and compartmentalization, analytic vs. relational categorizing, susceptibility to cognitive interference, and scanning.

Test-retest reliabilities over the one-year interval will be determined, and differences in corresponding means and variances between the two testing sessions will be evaluated. Base-free measures of change will be calculated for each test, in order to partition the difference in true scores between the two testing sessions into two components: one completely dependent upon initial position in the first session and one reflecting that part of the second performance that is completely independent of the previous performance. The reliabilities of these base-free change scores will be evaluated prior to computing their correlations with each other and with the cognitive and personality measures of the first battery.

In addition, a secondary focus of this study dealt with the malleability of categorizing consistencies. Subjects were required to sort the objects in the object-sorting measure of conceptual differentiation first under standard instructions and then in a new and different way. Facility in changing a natural category system could thereby be assessed, as well as the manner in which the change was brought about.

These indices of flexibility and style in changing conceptual categories will be correlated with cognitive style measures from the concurrent battery and with cognitive and personality measures from the previous battery.

A General Method for Analysis of Covariance Structures (NSF, 763-10; 763-11)

Mr. Jöreskog

PURPOSE: The purpose of this study is to develop a model and a method so general that the same computational algorithm can be used to analyze many kinds of covariance structures.

PROGRESS: A computer program has been written and tested. The applications performed so far include (a) first- and second-order factor analysis, (b) analysis of sets of congeneric tests, (c) analysis of simplexes and circumplexes, (d) analysis of multimethod-multitrait data, (e) analysis of multitest-multioccasion data, (f) path analysis and linear structural relationships, and (g) covariance structure analysis of multivariate random effects models. A separate version of the computer program includes structures on the mean vectors as well as on variances and covariances.

The general model and the method of parameter estimation are described in RB-69-46. Several examples of the usefulness of the general method are given in RB-69-47. These papers are published in Biometrika. A paper "Factoring the multitest-multioccasion correlation matrix," presented at the Psychometric Conference in honor of Paul Horst, Seattle, June 22, 1969, deals with applications particularly useful in growth studies. This paper is also available as RB-69-62. Another paper, RB-69-97, which will appear in Psychometrika, deals with the analysis of sets of congeneric tests. Still another paper, RB-70-42, is on the estimation and testing of simplex models. The computer program itself is described in RB-70-15.

A General Method for Estimating a Linear
Structural Equation System (NSF, 763-10; 763-11)

Mr. Jöreskog
Miss van Thillo

PURPOSE: The purpose of this study is to develop a general method for estimating the unknown coefficients in a set of linear structural equations. In its most general form the method allows for both errors in equations (residuals, random disturbances) and errors in variables (errors of measurement, observational errors) and yields estimates of the unknown coefficients in the structural equations as well as estimates of the residual variance-covariance matrix and the measurement error variances, provided all these parameters are identified.

PROGRESS: Two computer programs have been written, one for the general case and one for the special case when there are no errors in variables. Both programs are now being tested out. The methods are described in a paper to be presented at a "Conference on Structural Equation Models" in Madison, Wisconsin, November 12-16, 1970.

Retest Changes on Personality Scales
(USPHS, 767-2)

Mr. Stricker

PURPOSE: A ubiquitous tendency exists for scores on self-report personality scales to change over time, and in the direction of improved "adjustment," even though no experience intervenes that would be expected to produce such changes. This study seeks to clarify the meaning of these score changes by investigating the nature of individual differences in them. The study will determine the generality of individual differences in score changes on diverse personality scales, as well as the relationships of these individual differences to score changes and initial scores on cognitive and personality measures (not of the self-report type) selected for their relevance in testing hypotheses about the causes of these trends.

PROGRESS: Needed cognitive and personality measures were adapted or developed and administered with the Sixteen Personality Factors Test, the California Psychological Inventory, and the Personality Research Form in a pilot study. The data were analyzed and measures selected for use in the main study. The data for the main study have been collected and the statistical analysis is under way.

Risk Taking in the Context of Intergroup
Negotiation (ARPA, 769-1)

Mr. Kogan

PURPOSE: This study inquires into the relation of "decision freedom" to the risky shift and other aspects of dyadic negotiation. A negotiator with representative status in his reference group presumably negotiates with stronger commitment--less freedom of independent decision--than a member not elected to represent the group. Accordingly, in comparing the dyadic negotiations of representatives with those of nonrepresentatives, it is predicted that the former will (a) depart less from prior group position; (b) take longer to reach agreement; (c) give more favorable estimates of group's satisfaction with the negotiation outcomes; and (d) be more resistant to the psychological forces underlying the risky shift.

PROGRESS: A report (RB-69-35) has appeared and is now in press in the Journal of Experimental Social Psychology.

MAJOR FINDINGS: On the whole, the results of the experiment supported the hypotheses outlined above. (Project conducted in collaboration with Dr. H. Lamm of the Institute for Social Sciences, University of Mannheim, Germany.)

Effects of Representative Status and Decision Style
on Cooperation in the Prisoner's Dilemma (ARPA, 769-1)

Mr. Kogan
Mrs. Hermann

PURPOSE: The study has two major aims. The first is to examine the effect of being a representative of a group on behavior in the Prisoner's Dilemma (PD). To date in most research on the PD, subjects have acted in their own behalf, the interaction with the opponent being of major concern. What happens, however, if the opponents in the PD must not only be concerned about each other's behavior but also about how well they are representing a reference group? The second aim of the study is to explore the effects of decision style on responses in the PD. By decision style is meant a subject's way of approaching a decision-making task--e.g., his flexibility, his risk-taking dispositions.

PROGRESS: A preliminary report of the study was presented at the 1969 EPA meetings. A final report is currently in preparation.

MAJOR FINDINGS: The results suggest that whether or not a person is acting in his own behalf or representing a group in the PD will affect how he behaves. Representatives as opposed to individuals tend to be more cooperative to start with in the PD, particularly the highly committed representative. A relationship was established between personality and behavior in the PD. This success may stem from using the dyad instead of the individual as the unit of analysis and from examining the effects of personality across trials.

Individual and Group Decision-Making under
Conditions of Responsibility for Others (ARPA, 769-1)

Mr. Kogan

PURPOSE: In virtually all of the published research on individual and group decision-making, the decision outcomes have impinged only upon the individuals and groups making the decisions. Yet there are frequent occasions in the real world where the outcomes of a decision made by an individual or a group impinges upon others. The major purpose of the present study was to determine whether group-induced risky shifts would decline or disappear when the group's decision affected other people. Subjects selected particular probability-payoff combinations (with real monetary consequences) individually and in groups under conditions where outcomes impinged (a) solely upon the decision-makers and (b) solely upon other individuals.

PROGRESS: A report (RB-69-9) has been issued and submitted for publication. A condensed version has appeared in the Proceedings of the 77th Annual Convention of the American Psychological Association, 1969.

MAJOR FINDINGS: Under conditions of individual choice, subjects made more conservative decisions when outcomes impinged upon others than when outcomes impinged solely upon oneself. Comparing individual with group decisions, shifts in the direction of greater risk taking were observed irrespective of whether decision outcomes affected solely the decision makers or solely other individuals. The magnitude of the shifts were smaller in the latter case, though not significantly so. Thus, an induced responsibility for persons outside one's group does not seem to eliminate the risky-shift phenomenon in group decisions. (Project conducted in collaboration with Mme. M. Zaleska, Laboratoire de Psychologie Sociale, Sorbonne, Paris.)

Negotiation Behavior under Conditions of
Observation and Consultation (ARPA, 769-1)

Mr. Kogan

PURPOSE: In an earlier study (RB-67-51), leader-delegate dyads came to joint decisions, then were separated into all-leader and all-delegate negotiating groups with instructions to resolve conflicts of interest and achieve consensus. Differences were observed between the two group types, but these were not of great magnitude. We suggested that the differences might have been attenuated by the fact that leaders and delegates could exert no direct influence upon each other after the dyads were separated. In the present experiment, leaders and delegates negotiated in each other's presence. In half of the groups, leaders negotiated while delegates served as observers and consultants; in the other half, the roles were reversed. Differential negotiation outcomes were expected, given the inequality of power and influence between the leader and delegate roles.

PROGRESS: A report (RB-69-55) has appeared, and has been submitted for publication.

MAJOR FINDINGS: Predicted differences which failed to appear in the previous study (RB-67-51) were observed in the present research. Delegates negotiating in the presence of their leaders (relative to leaders negotiating in the presence of their delegates) were more likely to deadlock, to seek the opportunity for private consultation with their dyadic partners, and to consume more time both in consultation and actual group discussion. An additional finding of interest was the greater dissatisfaction with group decisions expressed by those in the role of observer than by those in the role of negotiator. (Project conducted in collaboration with Dr. H. Lamm and Miss G. Trommsdorff of the Institute for Social Sciences, University of Mannheim, Germany.)

Pessimism-Optimism and Risk-Taking (ARPA, 769-1)

Mr. Kogan

PURPOSE: An incidental finding in a recent research article points to a trend toward enhanced pessimism following risky shifts in groups. The present study attempts to replicate and extend the foregoing finding in a systematic experimental manner. Shifts in pessimism-optimism were examined following discussions focused on risk; shifts in risk were examined following discussions focused on pessimism-optimism. Appropriate control groups were employed in both cases.

PROGRESS: A report (RB-69-56) has appeared. A revised version is currently in press in the Journal of Personality and Social Psychology.

MAJOR FINDINGS: Asymmetrical effects of risk-taking and pessimism-optimism on one another were obtained. Discussions focused on risk led to enhanced risk taking and to increased pessimism concerning the success of the selected alternatives. Discussions focused on pessimism-optimism led to enhanced pessimism, but did not bring about a subsequent increase in preferred level of risk taking. (Project conducted in collaboration with Dr. H. Lamm and Miss G. Trommsdorff of the Institute for Social Sciences, University of Mannheim, Germany.)

General Research--Human Learning and Cognition
Area (770-1)

Mr. Carroll

Miscellaneous research conducted as general support of other activities included work on the development of a computer program to identify learning hierarchies that might not be readily detectable by ordinary multidimensional scaling programs. Specifically, these would be "disjunctive" hierarchies in which a given task C has as its prerequisites the mastery of either task A or task B. Although the program works well with hypothetical data, difficulties have been encountered in locating empirical data in which clear disjunctive hierarchies can be demonstrated. (This research is being conducted in collaboration with Dr. Lauren Resnick and Dr. Margaret Wang at the Learning Research and Development Center, University of Pittsburgh. A Research Bulletin reporting the work is planned.)

Tests of Cultural Development (770-32)

Mr. Diederich

PURPOSE: The purpose of this project is to discover types of difficulties in adult books that baffle and discourage many students at some point near age 14 when they must make a transition from juvenile to adult reading if their interest in reading books is to continue.

PROGRESS: Cooperative Tests and Services had already initiated the development of tests on 20 major literary works that are most widely taught in grades 9-12. The editing, extension, tryout, and statistical analysis of far more questions on these works than will be used in the final forms afford an opportunity to explore in depth the difficulties in a sample of adult books to which the largest number of young people are exposed.

The first seven of these tests have reached final forms and are being administered in a national sample of schools to establish norms. Others are scheduled for norming during the next school year.

The Attitudes and Values of a Minority Group: A Study
of the Attitudes and Values of Adult Female Homosexuals
(771-2)

Miss Keiffer

PURPOSE: To compare the attitudes and values of adult female homosexuals with those of heterosexual females.

PROGRESS: This study is in its early planning stage. An approach has been made to the New York City Gay Liberation Front to see if the female members of that group would be interested in participating in such a study. The study plan is to conduct intensive interviews which would include sociological data questions as well as questions relating to factors leading to the choice of homosexuality rather than heterosexuality.

Bargaining in the Mexican Marketplace (771-2)

Miss Keiffer

PURPOSE: To examine the bargaining process in a setting where bargaining occurs as a natural event. Three Mexican marketplaces were chosen as bargaining sites. At each site extensive interviews were conducted with local merchants to find out what local bargaining practices were. Items were bargained for using two general bargaining strategies, interest or disinterest in item, and two concession rates. It was expected that certain of these strategies would lead to no sale on the part of the seller, and that certain other strategies would lead to a lower final price for the buyer.

PROGRESS: Interviews and bargaining were conducted during the Summer of 1969. Analyses of bargaining transactions and content analysis of interview tapes have yet to be done.

Discrimination Experienced by Academic Female
Psychologists (771-2)

Miss Keiffer

PURPOSE: To document subtle and unsubtle discrimination experienced by women psychologists; to see how many women perceived that they had been discriminated against, or that discrimination existed within academic psychology; to see if discrimination was experienced equally in all areas of psychology. Questionnaires were sent to 314 female psychologists and 51 male psychologists who satisfied the following criteria: membership in one of Divisions 1-8 of APA, Ph.D. from an American university, presently employed in an academic setting, preferably a psychology department, majority of jobs since receiving Ph.D. in academic field, under age 65.

PROGRESS: Questionnaires were sent out and returned. Preliminary analyses reveal that approximately half of both the women and men feel that the standards for admission to graduate school in psychology are different for males and females. Forty per cent of the women have perceived discrimination. Divorced women are much more likely to have perceived discrimination than married women, and single women and widows are least likely to mention discrimination. Women who received their Ph.D. after 1950 are more likely to mention discrimination than those who received their Ph.D. earlier. Over half the women report that their advancement has been slower than men in their specialty. There is no difference between those who received their Ph.D. after 1950 and those who received it earlier, and only small differences between women of the various marital statuses. Half the women report that their advancement in terms of salary increases at their present institution has been worse than that of men. Slightly more women who received their Ph.D. after 1950 report doing worse than men on salary increases than those women who got their Ph.D. earlier, and a higher percentage of divorced women report doing worse than men on salary increases than either single or married women. A more complete data analysis is now under way.

The Effect of a Bargainer's Role on Bargaining Behavior
(771-2)

Miss Keiffer

PURPOSE: Bargainers either represent themselves in a labor-management bargaining game or are the bargaining agents for the fraternity that they are pledging. Fraternities at the University of Pennsylvania have agreed to make participation in a bargaining experiment part of their pledging week activities. It is hypothesized that when bargainers are agents they will drive a harder bargain and end up with a higher final contract than they would if they were bargaining for themselves alone.

PROGRESS: Subjects now being run at the University of Pennsylvania. (Study being done in collaboration with Allan Teger of the Psychology Department of the University of Pennsylvania.)

Women's Status and Population Control: A Bibliography
(771-2)

Miss Keiffer
Miss Warren

PURPOSE: To compile a complete bibliography on women's status and how it relates to population control. The bibliography will cover the following categories:

1. General works, historical studies, and status of women.
2. Anthropology, religion, and philosophy.
3. Biology.
4. Psychology.
5. Sociology and sociology of the family.
6. Social commentary.
7. Working women and women and the law.
8. Reproduction and population control.
9. Social, psychological, and economical influences on family size.

PROGRESS: The bibliography has been compiled and is awaiting proofreading and editing.

Study of Objective Tests of Personality
in Adults (771-6)

Mr. Damarin

PURPOSE: This study is intended to develop new objective (or performance) tests for R. B. Cattell's personality factors and to determine whether these tests and factors will differentiate among college students and persons with one of two types of personality disorder: alcoholism or psychopathic criminality.

PROGRESS: One hundred sixty-eight subjects including 114 students, 24 alcoholics, and 30 convicts with a diagnosis of psychopathic personality were administered 74 objective and self-report personality measures. The data were subjected to two separate analyses. In the first analysis, 57 chiefly objective test scores and three random variables were intercorrelated and subjected to principal axis factor analysis. Twenty-two factors were rotated graphically to simple structure. In the second study, 17 questionnaire variables, taken chiefly from Cattell's 16 PF, were intercorrelated and factored. Five factors were rotated graphically to simple structure. All of the variables were "extend in" to both factor matrices. In later studies, factor scores were computed and the significance of group differences on these scores was tested by analyses of variance.

MAJOR FINDINGS: A number of Cattell's personality factors including Extroversion and Anxiety were clearly identifiable in one or the other study. The data suggest that objective tests might be used to assess certain factors, such as Extroversion, that were previously defined entirely by self-report measures. There were few objective test loadings on the factor identified as Anxiety, however.

Group differences reaching the .01 level or better were observed on seven out of 22 objective test factors and four out of five questionnaire factors. Alcoholics and criminals were notably lower than students on a factor that might be interpreted as Socioeconomic Status or Cultural Advantage. Associated with low scores were poor performance on tests of ideational fluency; poor performance on tests of the recall of meaningful printed, auditory, or pictorial material, and a lack of speed and skill on psychomotor tasks. There is some reason to believe that this factor may not be general intelligence but instead a differential tendency to accept vs. reject school work and related intellectual disciplines.

Response Styles and Second-Order Factors
in the Personality Domain (771-7)

Mr. Stricker

PURPOSE: There have been some suggestions that second-order factors on self-report personality scales may reflect response styles, such as acquiescence and social desirability, rather than such content traits as extroversion, anxiety, and neuroticism. This study is intended to test such response-style hypotheses by examining the relationships between standard measures of these variables and second-order factors on Cattell's Sixteen Personality Factors Questionnaire (16 PF) and Jackson's Personality Research Form (PRF).

PROGRESS: The two inventories and standard measures of response styles have been administered to samples of high school students. The statistical analysis is under way. Four second-order and one third-order factor were extracted from the 16 PF, and six first-order and two second-order factors were extracted from the PRF. These factors have been hand rotated, and their relationships to the response style measures are currently being determined by extending the response style measures into the factor matrices.

The Influence of Observational Learning on
Conflict Resolution (771-12)

Mr. Rosenhan

PURPOSE: The study examines the influence of role models on the behavior of a subject in a moral conflict situation. The model is asked by a legitimate authority to inflict pain on another person. The model either acquiesces or refuses. The identical request is subsequently made of the subject, and the effect of his observing the model assessed.

PROGRESS: Data have been collected from high school seniors. A Research Bulletin is in preparation.

MAJOR FINDINGS: A model who accedes to the authority's request elicits no more acquiescence from subjects than subjects manifest in this no-model control condition. This seems to be a result of the high incidence of acquiescence in the control condition. Models who refuse to obey the experimenter strongly affect the observing subjects' subsequent behavior. These findings obtain regardless of whether the subjects "see through" the experiment, i.e., discern that they are not really inflicting pain.

Obedience, Rebellion, and Personality (771-12)

Mr. Rosenhan

PURPOSE: When people are asked by a legitimate authority to perform an act that they find morally distasteful (such as severely punishing an innocent person), some will accede to the request, while others will refuse. This study examines some personality characteristics that distinguish the obedient from the rebellious in this situation.

PROGRESS: Experimental data and a variety of personality data have been collected and are being analyzed. A Research Bulletin is in preparation.

MAJOR FINDINGS: The tendency towards acquiescence is rather marked among people who obey the experimenter. While this finding does not emerge on all scales, its presence on several of them suggests that obedient subjects are relatively less able to analyze and comprehend the implications of their behaviors.

Subjects were also sorted according to their ability to "see through" the experiment (regardless of whether they obeyed or disobeyed), that is, according to whether they felt that the innocent person was really receiving shock. Again, subjects who recognized the artificiality of the experiment manifested cognitive styles that were less acquiescent and more analytic than those who took the experiment at face value.

Prosocial Behavior (771-12)

Mr. Rosenhan

PURPOSE: The motivational bases of prosocial behavior are generally conceptualized either in terms of the reactions that altruistic people have to their own asocial impulses or in terms of their responses to prosocial group pressures. Except for occasional clinical studies, however, evidence for either of these formulations and empirical data upon which new formulations can be constructed are almost entirely lacking.

PROGRESS: Extensive depth interviews are being conducted with two groups of altruists: those who have risked their lives to save other people, and white people who have been active in the Negro freedom movement. Control and comparison groups are being established, and some control subjects have been interviewed. Papers have appeared in New Directions in Developmental Psychology (Holt, Rinehart & Winston), in J. Macaulay and L. Berkowitz (Eds.), Altruism and Helping (Academic Press), and in Young Children.

MAJOR FINDINGS: Analysis of interviews of people who have been active in the freedom movement over extended periods of time indicates that they have had models (primarily parents) who were also actively committed to altruistic behavior and with whom they were deeply identified. No evidence for the presence of significant psychopathology was located among these respondents. Subjects who were relatively less committed to "freedom activities" (i.e., those who engaged in such activities over relatively brief periods) gave evidence of ambivalent socialization. That is, they appear to have been exposed to models who preached altruistic concern but practiced self-indulgence. These discrepancies were noted by the respondents and produced varying degrees of hostility toward the parent.

Further analyses of these data are in progress. (Project carried out in collaboration with J. Bryan, Northwestern University, R. Kurtzman, Jerusalem, Israel, and P. London, University of Southern California.)

Cross-Cultural Study of Group Risk Taking
(771-16)

Miss Carlson

PURPOSE: The purpose of this study is to investigate, in African and American cultures, the processes by which groups come to decisions with regard to risk. The study involves a replication of some of the Kogan and Wallach experiments on the "risky shift" (i.e., an increase in risk following group discussion). Cultural factors such as a value placed on willingness to take risks and/or the customary methods of arriving at group decisions may be vital determinants of the results found consistently in Western culture.

PROGRESS: A preliminary report was presented at the 1968 Convention of the African Studies Association. A final report is in preparation.

MAJOR FINDINGS: The data were consistent with the presumed greater tradition-orientation among the Africans. The individual decisions of the African Ss were less risky than those of the Americans. In addition, the risky shift appeared to be less characteristic of the African groups. Questions were raised concerning the generality of the risky shift within Western culture. (This project was conducted in collaboration with Dr. Clive Davis of Syracuse University.)

Group Decision-Making in a Minimal
Social Situation (771-60)

Mr. Kogan

PURPOSE: The role of group discussion in generating enhanced risk taking in groups remains a controversial theoretical issue. The present study employed electronic semi-automated apparatus which permitted subjects to achieve a group consensus without the need for any verbal communication. The decision material consisted of five different probability-payoff combinations of equal monetary expected value. Subjects experienced 50 individual and 50 group trials with pre-programmed feedback (gain or no gain) following each trial. Comparison of individual and group risk levels is expected to yield information directly relevant to the theoretical issue under test.

PROGRESS: A total of 140 males and females--students at the University of Paris--participated in the experiment. Analysis of data has been completed and a report is in preparation. (Project conducted in collaboration with Roger Lambert of the Laboratoire de Psychologie Sociale, Sorbonne, Paris.)

MAJOR FINDINGS: Subjects manifested greater risk taking under group relative to individual conditions. Various group-decision models have been applied to the data. A model based on majority effects best accounts for the group-decision outcomes.

PURPOSE: This study explores creativity in a nonlaboratory setting, in which a heterogeneous and self-selected group supplied creative products without awareness that their productions would be used in a psychological investigation. Investigation will focus on: (a) A description of the nature of the product when individuals attempt to be creative outside the experimental laboratory; (b) A search for relations between creativity of product and subject variables such as sex and socioeconomic status; and (c) An analysis of the characteristics of products which lead to their being judged as more or less creative.

PROGRESS: In March 1969, a New York radio station held a "Little Green Things" contest; listeners were invited to submit humorous and original little green things, with cash prizes for those judged to be best. These products were obtained from the station and provide the creative products for this investigation. Individual identification was removed to protect the anonymity of contributors; but sex and address of contributor were recorded, the latter being used to obtain median income, education, etc., for the census tract in which the individual resides. This procedure assumes that individual contributors are to some extent representative of the census tract in which they live. With a subsample of these products, census data have been correlated with originality judgments given by four judges. A further subsample has been drawn, and a similar analysis will be performed for cross-validation. Judges will also rate the products on a variety of apparently simple dimensions--humorousness, complexity, amount of effort expended, etc.--in an effort to understand the characteristics of objects which are judged to be original.

MAJOR FINDINGS: About half the contributors to the contest submitted entries which involved little or no creative effort on their part; these were objects which were sent in their preexisting natural or manufactured condition. Reliable ratings of originality have been obtained from judges over a representative set of contributions, but interjudge agreement is higher for objects created by the sender than for those sent in their preexisting condition. Over all items judged, no significant relations of originality to census data were obtained; however, for things made by the sender, significant positive correlations were obtained between originality and socioeconomic status, as indexed by median years of education and by median income statistics.

Exploratory Research on the Escalation of Conflict
(771-86)

Mr. Teger

PURPOSE: Conflict theory has generally been concerned with total amount of conflict or the presence or absence of conflict. A theory of escalation, or growth of conflict, has been lacking. Through a series of laboratory and field studies an attempt is being made to develop a theory of escalation. Variables under investigation include: rate of escalation, value of victory, changes in the scope of conflict, and changes in the images of parties and issues as conflict progresses.

PROGRESS: Pilot studies have been run at Rider College for a laboratory study of escalation. The occupation of a campus building at Princeton University was examined in detail. (The occupation may be seen as a step in the escalation of conflict.)

MAJOR FINDINGS: The pilot data indicate that when a conflict is escalating, the rate of escalation will not be uniform (i.e., the curve will not be smooth). Rather, the conflict will escalate more rapidly immediately after the parties pass a "point of no return"--a point where a victory no longer means a profit but merely a regaining of losses. The conflict will de-escalate somewhat when it passes the point at which a party had anticipated a victory. Results of the Princeton building occupation study indicate that the occupation of a building will reduce student support for the radicals' demands, while increasing support for building occupation as a tactic. Other results support the mirror image hypothesis concerning perception of the enemy.

Informational Redundancy in Messages as a Function of
Stimulus Definition and Complexity (771-89)

Mr. Freedle
Mr. Kingsley

PURPOSE: In referential communication a person tries to map perceived features of his environment into language in such a way that the verbal description efficiently specifies his referent. That is, he constructs messages which contain enough information to be relatively unambiguous but, for reasons of economy, do not contain large amounts of superfluous information. It has been suggested (Olson) that people normally provide a certain amount of redundancy in their messages--they include comments which do not add any new information--but this redundancy is generally held to a low level. However, it is not clear how much redundancy people do normally use nor is it clear what variables affect the amount of redundancy used. The present research is an attempt (a) to assess level of redundancy of messages in a very simple situation which limits the number of stimulus features which might be encoded and makes the encoding of only one feature mandatory, and (b) to vary certain characteristics of the stimulus array and of a subject's perceptual set toward the array in an attempt to find conditions which affect redundancy level of messages. Five-item stimulus arrays were constructed such that the differences on a limited number of dimensions were all perfectly correlated across the five items--making it possible to specify uniquely any item in an array by naming one value on only one dimension. Subjects were asked to write a brief message describing a target item in each array so that a recipient of the message could pick that item out. Experimental treatments varied (a) the complexity of the stimuli (i.e., the number of dimensions on which they varied), and (b) the way stimuli were defined for subjects (i.e., as "bookends," vs. "buildings casting shadows," vs. "geometrical forms"). The latter manipulation was designed to vary the implied dimensionality of the stimuli--the extent to which they were perceived as constituted of many vs. few dimensions--independent of their actual dimensionality. The dependent variable, redundancy, was measured by counting the number of dimensions which subjects encoded in their messages, one dimension being the minimum number necessary (i.e., nonredundancy).

PROGRESS: Messages have been collected in two studies, the second largely a replication and extension of the first. Subjects were college-age adults in both studies, drawn, however, from somewhat different types of college populations. The data are presently in the process of being analyzed.

Perceptual Errors as a Function of Sex-Role Attitudes
(771-89)

Mr. Baskett
Mrs. Darley
Miss Keiffer
Mr. Kingsley

PURPOSE: That values and attitudes can affect perceptual processes, especially under conditions of tachistoscopic viewing, is well known. The purpose of the present research is to examine this phenomenon in an area of social functioning that (a) tends to be highly emotionally charged, and (b) has been undergoing change in recent years and is now an area of some controversy due to the Women's Liberation Movement, namely, sex roles. The present study involves tachistoscopic presentation of pictures portraying both sex role violations (e.g., a female ship's captain) and non-violations of sex roles to subjects who are required to say what each picture depicts. A paper-and-pencil attitude survey will be administered to these same subjects afterwards to get an assessment of the degree to which they hold conventional attitudes towards sex roles. Predictions for the study are: (1) for pictures showing sex role violations there will be less likelihood of correct identification of the sex of the central figure than for pictures portraying conventionally appropriate role behaviors, and (2) these results will be strongest in subjects whose attitudes toward sex roles are most conventional.

PROGRESS: Stimulus pictures are being drawn and apparatus set up preparatory to running subjects.

Relationship of Young Children's Referential Communication
Ability to Other Abilities (771-89)

Mr. Kingsley

PURPOSE: A number of investigators have found that young children perform quite poorly on referential communication tasks (i.e., tasks that require subjects to transmit information to a listener verbally such that one out of an array of possible referents is unambiguously specified for the listener). There are a number of possible reasons for the poor referential communication performance of young children and the purpose of the present research is to examine several of these. Analysis of the referential communication task suggests three component abilities upon which success in the task must depend. First, a subject must be able to perceive the dimensions and attributes upon which items in an array differ, in particular the dimensions upon which the target item differs from the others. Secondly, a subject must be able to encode these differences linguistically; he must be able to specify verbally relevant values on the critical dimensions. Finally, a subject must anticipate his listener's capabilities and perceptions--he must take account of his listener's perspective and informational needs--so as to transmit those dimensional values which have the highest probability of unambiguously specifying the target item for that listener. The present research design calls for assessment of subjects' performances on each of the three component abilities by means of (a) a perceptual oddity task, (b) a verbal encoding task similar to the oddity task but requiring verbal designation of the differences which define the oddity, and (c) a role-taking or perspective-taking task which requires subjects first to tell a standard story from the viewpoint of several different actors in the story and second to tell another story taking into account the amount of information the listener already has about the story. Relationships between levels of performance in these three component ability areas and performance by the same subjects on a two-person referential communication task will be examined. Subjects of several age levels from kindergarten to third grade will be used in an attempt to chart developmental changes in the three component abilities and in the relationships between these abilities and referential communication performance.

PROGRESS: The study is in the final stages of design and stimulus arrays are being selected. It is anticipated that subjects will be tested in the summer of 1970.

Social Class Effects in Referential Communication
(771-89)

Mr. Kingsley

PURPOSE: Several investigators have suggested that there are social class differences in the way language is used. Thus the speech of members of lower socioeconomic status (SES) groups is described by Bernstein as making use of a "restricted code" characterized by an impoverished use of linguistic possibilities and imprecise specification of referents. Middle-class speakers, on the other hand, are said to have access in addition to an "elaborated code," a code which makes use of a larger range of linguistic alternatives and enables fine differentiation among and precise specification of referents. Olson has noted that the user of a restricted code apparently assumes that his listener has a small set of alternatives from which he must differentiate his intended referent. Thus little information need be conveyed in order to specify a referent uniquely. However, elaborated code users must assume that their listener has a large set of alternatives in mind and therefore much information is needed to unambiguously designate any one of them. The present research is an attempt to develop a means of eliciting referential communications in such a way that the inference of the message producer regarding the size of his listener's set of alternatives can be measured and social class comparisons can be undertaken. For this purpose messages about some standard topic must be obtained from subjects. While the message topic should be specified rather definitely, it is desirable to leave the recipient of the message and his set of alternatives regarding the topic as undefined as possible, thereby forcing the message producer to infer the amount of information that he must transmit. In the present study subjects are asked to write messages to hypothetical recipients. Each of these messages is supposed to specify as unambiguously as possible a referent (equally relevant and familiar to high or low SES subjects) out of a range of alternatives that is left unlimited or very large. Thus the subject's inference regarding the size of the recipient's set of alternatives will constitute the primary constraint on the informational richness of his messages. A measure of the size of this inferred set of alternatives (and thus of informational richness) will consist of a count of the number of descriptive dimensions for which a value or a restricted range is designated in a message. The format for eliciting messages includes a short biographical questionnaire which provides information for ranking subjects on Hollingshead's Index of Social Position. The prediction, derived from Bernstein's theory, is that lower SES subjects will infer smaller sets of alternatives on the part of the hypothetical message recipient (i.e., fewer encoded dimensional values) than will the higher SES subjects. A primary goal at this point is to determine whether the scoring system described above can be applied to the kinds of messages elicited by the instrument. However, if enough variance in SES is present in the subject population, a preliminary test of Bernstein's theory can also be made.

PROGRESS: The first use of the instrument will be in June 1970 with a group of high school age subjects participating in a camp conducted by a mission school in Southeastern Kentucky.

Intercultural Attitude Study (772-11)

Mr. Gulliksen

PURPOSE: This study is using balanced incomplete block designs, complete paired comparisons, and successive intervals designs, with factor analysis and analysis of variance techniques, in comparing attitudes and preferences of different national groups. Eight different questionnaires relating to work, goals, aims, and activities have been given to respondents in Italy, Poland, Sweden, and the United States (Pennsylvania).

The eight questionnaires used were: (1) Prestige of Occupations, (2) Reasons for Work, (3) Choosing a Job, Part I (Methods), (4) Choosing a Job, Part II (Characteristics), (5) Goals of Life, (6) Means or Rules of Behavior, (7) Aims, and (8) Activities.

PROGRESS: Some concepts which appeared in the first three questionnaires and which were expanded in the latter questionnaires were: the subjects' interest in creativity and variety in work, the wish to dominate others, to achieve friendships, to be considered important; learning on the job, and being told what to do as contrasted with discussion of problems.

A comparison is made of the stability of factors resulting from factor analyses with the stability of the scale values of the total group. Tables have been drawn up. A final report is in preparation.

Learning (772-11)

Mr. Gulliksen

PURPOSE: A study of learning curves in cats is under way in an attempt to replicate learning curves in divided brain animals.

PROGRESS: A computer program for estimating parameters in the Audley-Jonckheere learning model has been written by James Ramsay now at McGill University. A learning model earlier proposed by Gulliksen is a special case of the Audley-Jonckheere model. The program uses a gradients method for estimating the learning parameters. The initial parameters are estimated by a least squares method. Then a maximum likelihood procedure is used in further analysis. For 33 pairs of learning records, the parameter estimates have reached convergence. In the analysis values were obtained for ρ , α , β , γ_1 and γ_2 . The sequence of learning trials commences with some initial probability of a correct response, ρ . A correct response increments the correct habit strength by an amount α and increments the incorrect habit strength by (γ_1 minus α). Similarly an incorrect response increments the correct habit strength by β and the incorrect habit strength by (γ_2 minus β). In the original program none of the parameters were allowed to go below zero, but the program has been revised so that one or more may be less than zero. Graphs are being plotted showing total trials and total errors to learning for various criteria for the right versus left brain learning records, and for comparison with the parameter values.

Statistical Adjustments When Comparing Preexisting Groups (772-21)

Mr. Lord

PURPOSE: A short report (RB-68-67) was written illustrating the inapplicability of analysis of covariance techniques for making statistical adjustments for comparing nonexperimental groups. The report is published in Psychological Bulletin, 1969, 72(3), 336-337.

Bayesian Inference (772-32; NICHHD, 780-2)

Mr. Novick

PURPOSE: The purpose of this research is to provide a satisfactory solution to the long-standing problem of specifying prior distributions over the states of nature required for Bayesian analyses, and to explicate a dual credibility-frequency theory of probability. For the parametric logical probability model, the central problem is that of obtaining a specification of the prior distribution which is independent of choice of parameter when it is assumed that there is no prior information available other than that contained in the specification of the parametric model. Previous efforts by Jeffreys, Fisher, and others directed toward the solution or avoidance of this problem have been subject to criticism on methodological grounds.

PROGRESS: Unique specifications within broad natural conjugate classes for some commonly encountered one and two parameter models have been obtained. The dual credibility-frequency theory has been shown to obtain for a general regression model. Methods for performing posterior analysis for Poisson, multinomial and normal models have been devised. The comprehensive statement "A Bayesian Indifference Procedure," by Novick and Hall, appeared in the December 1965 issue of the Journal of the American Statistical Association. An application of Bayesian logical probability methods in the area of clinical trials, "A Bayesian Approach to the Analysis of Data from Clinical Trials," by Novick and Grizzle, appeared in the March 1965 issue of the Journal of the American Statistical Association. A paper showing the multiparameter consistency of the proposed indifference procedure was presented for discussion before the Royal Statistical Society in London December 11, 1968 and appears in Journal of the Royal Statistical Society, Part I, 1968. Bayesian analyses for the Rasch-Poisson Process Model have been furnished by R. J. Owen (RB-69-64) and for the normal test theory model by Lindley (Research Bulletin in preparation).

MAJOR FINDINGS: The prior distributions which have been derived from the proposed indifference procedures have been found to be in substantial agreement with some of those previously accepted on (essentially) intuitive bases. However, the present system is often able to "explain" differences which have arisen among earlier specifications.

Statistical Models of Mental Tests
(772-33; ONR, 749-1, 749-2; NICHD, 780-2)

Mr. Novick

PURPOSE: The project is centered on the development and study of various test theory models. As the result of three years' work on this project, the theory of mental tests has recently been given a more precise axiomatic statement in the paper by Novick referred to below and in the Lord and Novick book Statistical Theories of Mental Test Scores. This project now centers its attention on the development of Bayesian methods for the analysis of mental test score data. Presently work is being done on the development of Bayesian methods for Rasch's item analysis model (RB-69-64) by R. J. Owen and the classical test theory model with independent and normally distributed errors and normally distributed true scores.

PROGRESS AND MAJOR FINDINGS: A preaxiomatic discussion of the foundations of classical test theory, the simplest case of weak true-score theory, appears in the February 1966 issue of the Journal of Mathematical Psychology. In this paper it is shown that the axioms of this theory are derivable as constructions from simpler assumptions. A characterization of the assumption of local independence in terms of the joint assumptions of experimental independence and homogeneity of error distributions is also provided. A second paper, "Coefficient Alpha and the Reliability of Composite Measurements," with Charles Lewis, which appeared in the March 1967 issue of Psychometrika, provides the specification of a meaningful necessary and sufficient condition under which Coefficient Alpha is equal to the reliability of a test. It is then shown that with the strengthened definition of parallelism given in the first-named paper the more obscure sufficient conditions originally given by Jackson and Ferguson and by Gulliksen are equivalent to the newly derived condition. A third paper, in collaboration with Professor Max Woodbury of Duke University, which appears in the June 1968 issue of the Journal of Mathematical Psychology, provides a more general solution than those previously given by Taylor and by Horst to the problem of maximizing the multiple correlation of a set of variables with a fixed criterion subject to the adjustment of the relative lengths of the predictors. Work has now been completed with P. H. Jackson on the problem of maximizing composite score correlation with criterion as a function of relative test lengths when unit rather than regression weights are to be used. A report on the research appears as RB-69-14 and will appear in the September 1970 issue of Psychometrika.

Bayesian Methods of Item Allocation
(772-35)

Mr. Owen

PURPOSE: To find optimum (sequential or otherwise) item allocation procedures using a Bayesian approach.

PROGRESS: Two Research Bulletins on problems in this area are described below. The first is completed (RB-69-92) and the second is near completion.

MAJOR FINDINGS: "A Bayesian Approach to Tailored Testing": The sequential design and analysis of a test consisting of dichotomously scored items is approached from a Bayesian viewpoint.

The scores on the items are taken to be independently distributed and each item characteristic curve is taken to be a weighted average of one and a normal ogive function (to include the case where guessing is effective). Taking a normal prior distribution on the examinee ability, explicit expressions are derived for the posterior distribution and its mean and variance.

In the decision theoretic framework of Wald, a quadratic loss function is taken and a simple, practical and approximately optimum procedure is derived for sequentially choosing the (difficulty, discriminating power and guessing constant of) items and analyzing the results.

"The Optimum Design, Using Prior Information, of an Examination for Inference about Items with a Normal Additive Model": An examinee's expected observed score (or true score) on an item depends on his ability and on the easiness of the item. In this paper the expected score is taken to be simply the sum of these quantities.

A Bayesian decision theoretic approach is taken so that any available prior information may be utilized. The choice of a criterion for optimality is the choice of a loss function. With a general multivariate normal intra-person error distribution the posterior distribution of the item parameters is derived. Taking a quadratic loss function Bayes' estimator of the item parameter vector and the optimum design for estimation is presented.

Fitting One Matrix to Another under Choice of a
Central Dilation and a Rigid Motion (772-72)

Mr. Schönemann

PURPOSE: A least squares procedure is described which may be useful to investigators who wish to compare results obtained with nonmetric scaling techniques across samples or who wish to compare such results with those obtained by conventional factor analysis techniques on the same sample.

PROGRESS: A least squares method is derived for fitting a given matrix A to another given matrix B under choice of an unknown rotation, an unknown translation and an unknown central dilation. A symmetric measure of fit is discussed. The method was programmed and applied to several data sets, both real and artificial. A Research Bulletin is available (RB-69-78). (This project is being carried out in collaboration with R. Carroll of Ohio State University.)

On Metric Multidimensional Unfolding (772-72)

Mr. Schönemann

PURPOSE: The problem of locating two sets of points in a joint space given the Euclidean distances between elements from distinct sets is solved algebraically.

PROGRESS: An algebraic formulation of the metric unfolding problem is presented together with its solution, which is discussed in some detail. For error free data the solution is exact, for fallible data it has least squares properties. A program was written to carry out the necessary computations. Several numerical illustrations are given to illustrate its use and the feasibility of using this procedure for the analysis of nonmetric data. A Research Bulletin is available (RB-69-93).

Models for Measurement and Learning (772-73)

Mr. Holman

PURPOSE: Two lines of research are being pursued: (1) simplification and extension of conjoint measurement, and (2) investigation of sequential properties of two-choice learning.

PROGRESS: (1) Two sets of conjoint measurement axioms have been established that require fewer assumptions than previous axioms. The first set relaxes certain solvability or cancellation requirements; and the second set is applicable to partial orderings of the sort that arise from comparisons of simple learning experiments. (2) The relatively weak assumption that the probability of a correct response never decreases from one trial to the next has been found to imply approximate equalities between many sequential statistics that are usually supposed to be independent.

MAJOR FINDINGS: (1) Although there are some exceptions that warrant further investigation, the second set of conjoint measurement axioms seems to be satisfied to a first approximation by most of the available learning data. Consequently, the asymptotic response probabilities observed in simple learning experiments can be ordered according to the sums of two functions in the case of classical conditioning, and three functions in the case of instrumental conditioning. (2) When used to distinguish between learning models, most sequential statistics contain relatively few degrees of freedom. Moreover, and rather surprisingly, these sequential statistics tend to reflect the total distribution of response probabilities over all trials, rather than trial-by-trial changes in response probabilities.

A Computer Model of Everyday Human Thinking (772-74)

Mr. Leaf

PURPOSE: A roughly-outlined model of the processes people use in normal thinking has been formulated from recent research and theorizing. The type of thinking modeled is specifically that used by a person in maintaining a valid picture of the outside world and its relations to him. The model is being written as a computer program (in a list-processing extension of PL-I) to force specification of the implicit or vaguely-indicated details of the description of the model. After being coded, the model will be tested for its effectiveness in handling situations on a representation of recent United States foreign affairs.

PROGRESS: The model has been more completely described in a set of flow charts which are currently being transcribed into coded computer statements. The model represents the environment as a set of concepts interrelated by a set of verb-like relations in concept-relation-concept sentences. It integrates new information into that representation by a two-stage method: (a) The information is evaluated for truthfulness by processes similar to induction and deduction, and (b) the result is screened for psychological dissonance and modified if necessary before being added to the representation of the environment.

A List Processing Extension to PL-I (772-74)

Mr. Leaf

PURPOSE: PL-I is a relatively new computer language described by IBM as an extremely sophisticated language combining algebraic power with the ability to deal with data in a wide variety of forms. PL-I is intended to eventually become the standard language for programmers whose applications currently require many different languages. One weakness in PL-I is its poor facility for dealing with alphanumeric or numeric data stored in variable-length lists. Routines are being written which will give programmers easy methods of generating and manipulating such lists while retaining the full power of PL-I.

PROGRESS: The basic routines have been coded in PL-I and 360 assembly language. Patterned after SLIP, the routines will produce and manipulate circular lists which can contain data of all basic types allowable in PL-I. Features include the dynamic allocation of space to handle increasing storage requirements of increasing-size lists, simple and informative input/output of list structures, and convenient manipulation of data on the lists.

The routines are almost completely debugged and are stored on OCS. SLIPLIB, may be used as a linkage-editor automatic call library. Also available is a subroutine called SNOSCAN, which duplicates the basic SNOBOL text processing facilities for PL-I character strings. A manual which describes the features and uses of PL-I/SLIP and SNOSCAN is currently being prepared.

Least Squares Matrix Factorization and
Multidimensional Scaling (772-75)

Mr. Bechtel

PURPOSE: Although least squares matrix factorization is one of the most widely used psychometric techniques extant, there is no clear and fairly direct proof of this result in psychometric literature. Therefore, the first purpose of the present project is to provide such a proof. The second purpose is to present some theoretical and practical aspects of this result. Finally, the least squares factorization method is applied in several papers in the area of multidimensional scaling.

PROGRESS: A paper on least squares matrix factorization is now complete, except for the section on theoretical and practical aspects. A second paper, which applies matrix factorization to the multidimensional scaling of skew-symmetric (choice) layouts, has appeared as RB-69-73. This was also presented as part of the symposium on "multi-mode factor analysis" at the 1969 Spring meeting of the Psychometric Society. A third paper, which uses matrix factorization in the multidimensional scaling of symmetric layouts has also been written (RB-70-22). A fourth paper uses matrix factorization in a "multidimensional unfolding" analysis developed by Schönemann. This empirical paper involves an unfolding analysis of political choice data which are analyzed by a different model in the second paper. This latter work is currently in the data analysis stage. A fifth paper uses matrix factorization as an adjunct to the analysis of variance in order to least squares fit general nonlinear models to data layouts. This is in the review process as a Research Bulletin.

MAJOR FINDINGS: Two major dimensions were extracted from the political choice data by the model presented in the second paper. These dimensions appear to represent "liberalism-conservatism" and "political audacity." On the purely theoretical side, explicit conditions have been found for the exact least squares fitting of nonlinear models to data layouts usually treated by the analysis of variance.

Application of Bayesian Methods in Educational Testing
(772-76)

Mr. Jackson

PURPOSE: To study the application of Bayesian statistical methodology to the classical test theory model and to academic prediction.

PROGRESS AND MAJOR FINDINGS: The work was carried out in collaboration with M. R. Novick and D. V. Lindley. A nontechnical description of some aspects of the work and its relevance to current educational problems--particularly those of guidance--is given in RB 69-83, and will be published in the September issue of the Review of Educational Research. In RB 70-6, Bayesian methods are applied to the estimation of true score, reliability, error variance and true score variance: the circumstances in which Bayesian results will agree with classical results or differ from them (e.g., when the classical estimate of true score variance is negative) are discussed. In RB 70-32, Bayesian methods are applied to academic prediction (viewed in the framework of guidance), where they allow "informal" information about the homogeneity of groups of colleges to be used to strike a compromise between estimating regression lines for each college separately (poorly, since data will be very limited), and pooling all the data from the group to obtain a single regression line.

Learning from Verbal Discourse in Educational Media
(USOE, 775-1)

Mr. Carroll

PURPOSE: To review the psychological and educational literature on learning from connected meaningful verbal discourse. The theoretical background (or lack thereof) of research in this area will be examined critically as well as the generalizability and applicability of the results to problems of educational media (film, TV, programmed instruction, etc.).

PROGRESS: About 2000 pertinent references have been collected and are being reviewed. Four chapters have been written for a monograph that will have the following chapter headings: introduction; theory of verbal comprehension and learning; problems of measurement; source and message characteristics; stimulus modality factors; presentation factors; student and learner response factors; and characteristics of educational media with reference to learning from verbal discourse.

Developmental Study of Attention within the
First Two Years of Life (NSF, 776-1)

Mr. Lewis
Mrs. Wilson
Mrs. Baumel
Mrs. Ban
Miss Van Wyk

PURPOSE: The purpose of the study is six-fold: (1) To study response decrement developmentally across age during the first two years of life. (2) To study cross-modality similarities in response decrement e.g., visual and auditory modalities. (3) To study the effects of complexity in both the auditory and usual modalities, specifically their effect on response decrement. (4) To compare response decrement to the mother-infant interaction. (5) To compare response decrement to other measures of cognitive skill, specifically the Piaget scale of Object Permanence and the Bayley Mental Development Scale across the first two years. (6) To compare birth condition to attentional differences.

PROGRESS: A cross-sectional sample and a longitudinal sample of infant subjects are being observed at 3, 6, 9, 12, 18, and 24 months.

School-Age Children's Comprehension of Words with
Multiple Grammatical Functions (USOE, 777-1)

Mr. Carroll

PURPOSE: Many words in English have multiple grammatical functions. Sometimes the meaning is essentially the same (e.g., age as a noun and as a verb); sometimes the meaning changes somewhat or even radically from one part of speech to another (e.g., skirt as a noun vs. skirt as a verb). The study attempts to test the hypothesis that children will have more difficulty understanding sentences in which certain words are used in relatively less frequent grammatical functions, as compared with sentences in which these words appear in their more frequent grammatical usages, even when the sense of the word causing the difficulty is related to the sense of the word in its more frequent grammatical function. Studies are to be conducted at the 3rd, 6th, and 9th grade levels using exclusively written material. The study is also considered to have theoretical interest for certain problems of psycholinguistics.

PROGRESS AND MAJOR FINDINGS: From various sources, a pool of about 1500 words was compiled, varying in their frequency of occurrence in large samples of English prose. About half of these were found to be words having multiple grammatical functions (MGF). For the MGF words, preliminary estimates were compiled concerning the relative frequency with which they appeared as nouns, verbs, or adjectives in order to identify 240 words to be used in further phases of the study. In a pilot experiment in which samples of children were presented with small numbers of MGF words intermixed with non-MGF words, and asked to make sentences using these words, it was established that a non-MGF word (having only one grammatical usage) immediately preceding an MGF word had no significant effect on the part of speech in which the MGF word was used. In a further experiment, data were obtained on the relative frequency with which 240 MGF words were used in different parts of speech when the pupils were asked to write 1 or 2 sentences exemplifying the uses of the word. Generally, these relative frequencies corresponded to the preliminary estimates that have been made subjectively or by reference to certain sources of objective data. In the final phase of the study, now in progress, data are being obtained on children's ability to understand the meaning of 63 MGF words in different grammatical functions. Two major testing techniques are employed: (1) sentence evaluation test, in which the word is used in either a high frequency usage, a low frequency usage, or an anomalous usage in a sentence and the respondent has to judge whether the usage is correct or not, and (2) a "headlines" test, employing the word in a high frequency or a low frequency usage, with the respondent being asked to show understanding of the meaning by making a paraphrase of the "headline."

Selective Attention in Children
(USOE, 778-1)

Mr. Hale

PURPOSE: To assess the validity of hypotheses regarding developmental changes in selective attention, children at ages 4, 8 and 12 were given a "component selection" problem adapted from similar paradigms used in research with adults. The task measures the degree to which children attend to component dimensions of stimulus objects (e.g., shape, color, pattern). The experiments conducted during this period were designed primarily to establish a task of optimal difficulty level for the age levels included and to compare performance on the component selection problem with other measures of selective attention.

PROGRESS: Data collection on four major experiments has proceeded from October, 1969 to June, 1970 and has recently been completed. The study has involved individual testing of about 1000 subjects at three age levels, 4, 8 and 12. The data of the first experiment have been analyzed, and data analyses for Experiments 2, 3 and 4 are currently under way.

MAJOR FINDINGS: A task of optimal difficulty level for the age levels included was established on the basis of data from the first experiment. The results of this experiment indicate little developmental change in component selection. The remaining experiments, which include manipulations designed to influence children's selective attention (e.g., overtraining and instructional variables), will aid in interpreting this result.

Methodology and Research Strategy in the Study
of Developmental Change (779-2)

Mr. Wohlwill

PURPOSE: This project is devoted to a systematic treatment of problems of methodology, research design, data analysis and scientific inference arising in the study of behavioral changes which occur during the course of the individual's development. Particular attention is being given to the following topics: (a) the measurement of changes along behavioral dimensions applicable over extended segments of the age continuum; (b) a discussion of problems of design in developmental research, with particular reference to the uses of longitudinal as compared to cross-sectional data, and variants of these two models; (c) the descriptive analysis of the form and characteristics of the developmental function; (d) the analysis of interrelationships between variables over the course of development; (e) the application of the experimental method to the study of developmental functions; and (f) the integration of the study of developmental changes with the study of individual differences.

PROGRESS: A paper (RB-69-40) discussing the status of the age variable was prepared and is published in Psychological Review, 1970, 77, 49-64. An accompanying paper was distributed as a Research Memorandum (RM-69-29) dealing with several of the above-mentioned problems; it was prepared for a conference on Life-Span Developmental Psychology, held late in April 1969, and is published in P. B. Baltes and L. R. Goulet (Eds.), Theory and Research in Life-Span Developmental Psychology (New York: Academic Press, 1970, Ch. 6). An initial draft of the first seven chapters of a book to be devoted to this topic has been completed.

A Longitudinal Study of the Formation of Concepts
of Conservation and Classification, as Related to
the Development of Spontaneous Cognitive Activities
(779-2)

Mr. Wohlwill

PURPOSE: This is a research project currently in progress at Clark University, with support from the National Science Foundation. It aims to assess changes in children's responses to tasks of conservation, class-inclusion and class-intersection over an 18-month period, and to relate these to changes in their approach to situations calling for spontaneous activities involving ordering, measuring and classifying activities.

PROGRESS: An initial test and two retests have been administered to 94 children who were in Kindergarten and Grade 1 at the start of the study. Data for the first two of these sets of tests have been analyzed; analysis of the data for the third test is currently in progress.

MAJOR FINDINGS: On the basis of the data analyzed thus far, suggestive indications have been obtained of a relationship between conservation and measurement, such that a minimal level of proficiency in the latter area is necessary for advances in the former area to occur. Similar relationships have been found between class-intersection and conservation, while a picture of a more nearly parallel progress emerges for the relationship between conservation and seriation activity. Spontaneous classification activities bear no relationship to the acquisition of conservation, and are only slightly related to the formation of concepts of classes.

Precision of Prediction (NICHHD, 780-3)

Mr. Browne

PURPOSE: This project is concerned with methods for increasing precision of prediction.

PROGRESS: An estimator of "weight validity" (the correlation over future observations between a criterion and a weighted composite of predictors using weights obtained from a calibration sample) has been derived under the assumption that the predictors and criterion have a multivariate normal distribution. Monte Carlo experiments have indicated that the estimator is preferable to previously obtained estimators of weight validity or "corrections for shrinkage."

A "mean squared error" measure of the precision of predictions in future samples has also been considered. The variance of an existing estimator has been obtained. A significance test has been provided for deciding whether the use of additional predictor variables can be expected to result in a decrease in the mean squared error of prediction.

An extensive series of artificial experiments has been carried out to compare principal component regression and factor analysis regression with the standard forward selection procedure. Sets of 100 sample covariance matrices were generated artificially from three populations. A stratified sampling procedure was used. These sample covariance matrices were then used to compare principal component regression, factor analysis regression, and the forward selection regression procedure in terms of the accuracy of predictions.

MAJOR FINDINGS: The following conclusions were drawn from the series of artificial experiments:

- (1) None of the procedures examined can be said to be superior to the others in all situations.
- (2) Although principal component regression can give good results in some populations, very poor results can be obtained in other populations.
- (3) Statistics developed for use in standard multiple regression appear to give satisfactory results when used in principal component regression or factor analysis regression.
- (4) The effect of "capitalizing on chance" in a forward selection procedure can be substantial on estimates of population parameters, but is less marked on measures of precision of prediction.
- (5) When the original sample is small it is advisable to make use of a small number of predictors even if this means selecting a subset of predictors from a larger set.

Research Bulletins on measures of predictive precision and on the use of factor analysis in regression are available (RB-69-69, RB-70-21).

Estimation of True Score and Error Variance for Tests
under Various Equivalence Assumptions
(NICHHD, 780-8)

Mr. Kristof

PURPOSE: Estimation of true score variance and error variance for mental tests is a central issue of test theory. For instance, test reliability is usually defined as the ratio of true score variance and total variance. Statistical estimation of these quantities requires replication of measurements over tests or parts thereof. In each case it is necessary to assume some sort of equivalence between tests. There are various degrees of equivalence conceivable, and in each case different estimation procedures may be indicated. Main emphasis will be placed on essentially tau-equivalent measurements. A statistical theory of such measurements is sought.

PROGRESS: A statistical theory of true score and error variance for six models of equivalence has been developed and presented at the 1968 Mathematical Psychology Meeting at Stanford. The work is contained in RB-68-57 and has been published in Psychometrika, 1969, 34, 489-507.

MAJOR FINDINGS: Maximum-likelihood estimators of true score variance and error variance for mental tests are derived for six different models of equivalent measurements under (partly immaterial) normality assumptions. Statistical properties of the estimators are examined. In some cases, sampling distributions are given explicitly. A statistical criterion for (essentially) tau-equivalent measurements is given. The solution of the comparatively simple maximum-likelihood equations is effected by means of a rapid Newton-Raphson procedure in the case of (essentially) tau-equivalent measurements. Two different initial estimators are considered and their relative merits in terms of second moments evaluated. Four numerical examples are appended by way of illustration. Results coincide very nearly with those obtained by a certain least squares approach. This leads to considerable simplification of the estimation procedures. Reliability estimation for (essentially) tau-equivalent measurements is given special attention.

Generalization of a Theorem by John von Neumann
on the Trace of Certain Matrix Products
(NICHHD, 780-8; 772-63)

Mr. Kristof

PURPOSE: In 1937, John von Neumann gave a theorem on the maximum of the real part of the trace of a matrix product $Z_1 A_1 Z_2 A_2$ where A_1, A_2 are fixed complex matrices and Z_1, Z_2 run independently over all unitary matrices. An extension of the theorem is sought admitting analogously $\text{tr } Z_1 A_1 \dots Z_n A_n$, $n > 2$.

PROGRESS: A report of the work is contained in RB-69-66.

MAJOR FINDINGS: The desired extension has been established. The proof is not related to von Neumann's method. Four seemingly different, but in fact equivalent, versions of the result are given. These differences stem from initially requiring A_j to be real diagonal as well as from considering separately the maxima of the absolute value, the real part and the imaginary part of $\text{tr } Z_1 A_1 \dots Z_n A_n$. In admitting complex matrices, the work generalizes results reported in RB-69-21. An application is given by way of illustration.

Generalization of "A Theorem Concerning the
Rearrangements to Two Sets"
(NICHHD, 780-8; 772-63)

Mr. Kristof

PURPOSE: In 1967 Hardy, Littlewood and Pólyz proved a "very simple, but important," theorem on rearrangements of two finite sets of real numbers. The authors established upper and lower limits for $\text{tr } P P' \Delta$ when P varies unrestrictedly over the group of permutation matrices and Γ and Δ are real diagonal matrices. The sought generalization consists in substituting unitary matrices Z for P and replacing P' by the hermitian transpose of Z .

PROGRESS: A report of the work is contained in RB-69-85.

MAJOR FINDINGS: The range of the function $\text{tr } Z \Gamma Z^* \Delta$ is determined when Γ and Δ are real diagonal matrices and matrix Z with hermitian transpose Z^* varies unrestrictedly over the group of unitary matrices. Two equivalent versions of the result are given. The real case (Z restricted to be real orthogonal) is considered separately. Two applications are appended by way of illustration.

On Proportional Profiles in Factor Analysis
(NICHHD, 780-8; 772-63)

Mr. Kristof

PURPOSE: It is intended to examine a number of problems connected with proportional factor profiles. Existence questions, ways of transformation and goodness of fit criteria are studied. Such problems arise, e.g., in multivariate selection situations.

PROGRESS: A number of pertinent theoretical results have been obtained. Their incorporation in a more complete theory is sought.

MAJOR FINDINGS: Necessary and sufficient conditions for the existence of proportional factor profiles on the basis of factor matrices and factor patterns are established. The merits of different goodness of fit criteria are evaluated. The problem of proportional patterns is reduced to the problem of proportional profiles involving factor matrices. The methods employed are based mainly on eigenvectors and eigenvalues.

A Theorem on the Trace of Certain Matrix Products
and Some Applications (NICHHD, 780-8; 772-63)

Mr. Kristof

PURPOSE: Attainable upper and lower limits of the trace of matrix products of the form $X_1 \Gamma_1 X_2 \Gamma_2 \dots X_n \Gamma_n$ are sought when X_i denotes an orthogonal matrix and Γ_i a diagonal matrix. Matrices X_i are allowed to vary unrestrictedly and independently. Matrices Γ_i are held fixed. Many problems in psychometrics involving the extremization of traces can be solved simply and without the use of awkward and, at times, problematic differentiation when the above-mentioned limits are known.

PROGRESS: A report of the work is contained in RB-69-21, which has been accepted for publication by the Journal of Mathematical Psychology.

MAJOR FINDINGS: The desired limits of the trace of above matrix products have been established with the help of two lemmas. Complete induction was employed. The usefulness of the theorem is demonstrated by application to a number of examples taken from the literature. Some of them become rather trivial in the presence of the theorem.

On the Theory of a Set of Tests Which
Differ Only in Length (NICHHD, 780-8; 772-63)

Mr. Kristof

PURPOSE: A contribution to the sampling theory of a set of homogeneous tests differing only in length is presented, test length being regarded as an essential parameter.

PROGRESS: A report of the work is contained in RB-70-26.

MAJOR FINDINGS: Upon formulation of the basic model it is shown that in a combination of such tests forming a "total" test, the signal-to-noise ratio of the components is additive and that the inverse of the variance-covariance matrix of the component measures has all of its off-diagonal elements equal, regardless of distributional assumptions. This fact facilitates the subsequent derivation of a statistical sampling theory. In developing the theory, the cases of known and unknown test lengths are treated separately. For both cases maximum-likelihood estimators of the relevant parameters are derived when the variance-covariance matrix of the components follows a Wishart distribution. Tests of the validity of the model and of hypotheses concerning reliability and standard error of measurement of the total test are also given. It is explicitly shown that in each case the maximum-likelihood equations possess precisely one acceptable solution under rather natural conditions. Application of the methods can be effected without the use of a computer. Two numerical examples are appended by way of illustration.

Extensions of Luce's Choice Theory (NICHHD, 780-25)

Mr. Freedle

PURPOSE: This project examines the possibility of modifying Luce's choice models in order to account for asymmetric recognition matrices and asymmetric signal detection ROC curves, for example. His discrimination model has been modified along lines which allow for the effects of "irrelevant" alternatives and perceptual anchors on choice probabilities.

PROGRESS: A report on the sources of asymmetry effects in a syntactic confusion study was presented at the 1969 Psychometric Society meetings and is now available (RB-70-40). A second paper on the effect of irrelevant alternatives on response probabilities in a weight discrimination task (the Shipley-Luce data on two-choice and three-choice weight discriminations) was presented at the 1970 Psychometric Society meetings.

The Psychology of Response Styles (NICHHD, 781-1)

Mr. Damarin
Mr. Messick

PURPOSE: This study aims at learning whether response styles can be explained as personality traits and whether these traits can be measured in situations that do not call for voluntary self-description. Until recently response styles (such as acquiescence, desirable responding and extreme responding) have been conceptualized chiefly as nuisance variables that contaminate tests, especially questionnaires dealing with personality or social attitudes.

PROGRESS: The (large) literature on response styles has been surveyed for evidence linking stylistic responding with personality traits. Correlational and factor analytic studies containing response style measures and objective (or performance) measures of personality have been sought out for evaluation. Twelve published studies by R. B. Cattell provide some evidence that the sought-after relationships can be found. Research Bulletin 65-10 covers this phase of work.

The review suggested a number of ways in which response styles research may be improved. Current measures of the styles themselves may not be optimal. Acquiescence tests, for example, may be contaminated with two other response styles, desirability and inclusiveness (or acceptance), as well as with item content. There are too few conceptually appropriate methodologically sound criterion measures of the personality traits supposedly responsible for stylistic responses. Current theorizing about response styles often seems too narrowly conceived to account for actual laboratory data.

MAJOR FINDINGS: More recent work suggests that response styles in questionnaires may be viewed as facets of the larger problem of self-descriptive behavior. In RB-69-10 Damarin provided a latent structure model in which accuracy of self-description governs the relative prominence of stylistic versus content variance. The model correctly predicted heretofore unobserved effects in the correlation of experimental MMPI scales.

Another version of this model has been successfully applied to personality test responses of preschool children. It correctly predicts the emergence of different response styles at different levels of general intelligence. A report on this work is in preparation.

Creativity and Classroom Behavior (NICHHD, 781-25)

Mr. Ward

PURPOSE: An exploratory attempt will be made to determine whether there are identifiable behaviors in the classroom associated with the child's creativity.

PROGRESS: Six classes (fourth through sixth grade) in one urban elementary school have been observed, using a modification of Medley's OScAR procedure which allows identification of the particular child involved in any teacher-child interaction. Creativity and achievement data have also been obtained for the children. Analysis is in progress.

MAJOR FINDINGS: Reliable interjudge agreement was obtained for the major observation categories: number of times pupil initiates an interchange with teacher; teacher initiations which are procedural; teacher's divergent questions; teacher's convergent questions; positive outcomes of interchanges for pupils; and negative outcomes for pupils.

Growth and Stability of Creativity During the School Year
(NICHHD, 781-25)

Mr. Ward

PURPOSE: Mean levels and intercorrelations of creativity test performance will be obtained for two administrations six months apart during the school year. Growth and consistency of individual differences in creativity over this period will be examined as a function of type of creativity test (semantic or figural content), ability (standard achievement test scores), and personality (test anxiety and social desirability).

PROGRESS: Data have been collected on six classes, comprised of fourth through sixth graders, in one urban elementary school. Analysis is in progress.

MAJOR FINDINGS: Data from the first administration show highly reliable correlations between the two tests; one with figural and one with semantic content, given at that time, and significant but lower correlations between ability and creativity. Significant grade level differences in creativity are obtained for tests with either type of content.

Study of Objective Tests of Personality in Children
(NICHHD, 782-1)

Mr. Damarin

PURPOSE: This study was designed to define better the personality traits of nursery school and kindergarten children in order to provide a more secure basis for the study of personality and development and change during later childhood and adolescence. Objective tests and performance measures were designed for children ranging from four-and-a-half to six years of age who were drawn from nursery school, kindergarten classes, a military base, and a camp for underprivileged urban children.

PROGRESS: A matrix of 18 factors and 93 variables was rotated to oblique simple structure by the author and John Hundleby at the University of Illinois. From the intercorrelations of the primary factors, five second-order factors were extracted and rotated to oblique simple structure. Two third-order factors were found. A hierarchical structure of 25 factors was obtained.

MAJOR FINDINGS: There is some basis for inferring a similarity between child and adult temperamental traits in perhaps six out of 18 first-order factors in this study. Several other factors could be interpreted as traits observed in children by child psychologists. These included: perseverance, impulsiveness vs. reflectiveness, and interest in fantasy. Several factors were associated with tests for such response styles as acquiescence and defensiveness, suggesting that stylistic responding occurs in children at this age.

The higher-order factors were often interpretable as aspects of ability. Of particular interest was the tentative identification of the two third-order factors as Cattell's Fluid Ability and Crystallized Achievement.

There were indications--now being further explored--that ability may moderate the intercorrelations of personality test scores in children at this age level.

Research Bulletin 66-42 describes the first-order factors in terms of Cattell's scheme of temperamental traits. This has been superseded by a revised and much more complete report which appears in the Monographs of the Society for Research in Child Development, 1968, 33(6, Serial No. 122).

PURPOSE: Recent studies of perceptual and cognitive response patterns of schizophrenics have indicated striking differences between groups of patients with different symptom patterns (paranoid vs. nonparanoid), different levels of adequacy in life adjustment prior to illness (good premorbid vs. poor premorbid adjustment), and different lengths of institutionalization (acute vs. chronic). The present study attempts to utilize the extreme forms of cognitive organization and various personality trait patterns.

PROGRESS: An extensive battery of perceptual, cognitive, and personality measures has been administered to a sample of 95 hospitalized schizophrenics. These procedures were administered either individually or in small groups of four or five patients. The battery included measures of perceptual field-independence (Rod-and-Frame Test, Embedded-Figures Test), element articulation, form articulation, scanning, verbal closure, perceptual closure, extremity and confidence of judgment, category width, risk taking, leveling-sharpening, conceptual differentiation (object sorting), ideational fluency, and verbal comprehension. Also included were items of case history information; a personality inventory assessing several dimensions of neuroses and character disorder; and several rating scales for symptom expression, properties of delusions, and suddenness of onset of illness.

The sample contained roughly equal numbers of paranoids and non-paranoids, who in turn were approximately equally divided into acute and chronic subgroups (using 18 months of hospitalization as the dividing point). The scoring of these measures has been completed, and their reliability for this sample has been appraised and found satisfactory. Various analyses are under way to evaluate subgroup differences on cognitive style and personality measures (in a 2 x 2 breakdown of paranoid vs. nonparanoid and acute vs. chronic patients) and to isolate patterns of cognitive style-personality trait interrelations. (Study done in collaboration with J. Silverman of NIMH and D. N. Jackson of University of Western Ontario.)

Longitudinal Study of Creativity (NICHHD, 782-5)

Mr. Kogan

PURPOSE: The long-term stability of measures of creative ability has not been systematically explored. Fifth-grade children who participated in the Pankove-Kogan study (Journal of Personality, 1968, 36, 420-439) have been retested after an interval of five years. Approximately 75% of the original sample was still in the same school systems and hence accessible for retesting. In addition to the readministration of the Wallach-Kogan tasks, the subjects were given a brief questionnaire intended to tap extracurricular accomplishments.

PROGRESS: Collection of data has been completed and analysis is currently under way.

A Developmental Study of Social Expectations
(NICHHD, 782-6)

Mr. Emmerich

PURPOSE: This study investigates the development of differentiated shared beliefs on how the self should act toward others (norms). Middle class children and adolescents judged the normative import of statements differing in (1) social content, (2) sex and generation of reference figures holding norms for the self, and (3) sex and generation of recipients of the self's action. The study is addressed to the following empirical questions. What are the bases for normative differentiation in middle class children and adolescents? (2) Do axes of normative differentiation change in the course of development? (3) How do normative differentiations held by the self correspond to those attributed to other sources, and do patterns of identification with norm sources change with development? (4) Are there sex differences in the above? (5) Are developmental changes in normative differentiation mediated by developing cognitive structures?

PROGRESS: Using a paper-and-pencil instrument, data were collected on 680 middle class children and adolescents ages 8 through 17. Age-trend analyses were conducted on a variety of normative differentiation scores derived from the instrument's facet design. Sex and academic aptitude (high vs. low) were treated as moderators of developmental trends. A monograph reporting major substantive findings has been submitted for publication. (Study done in collaboration with K. S. Goldman and R. E. Shore.)

MAJOR FINDINGS: Findings revealed many age changes in normative differentiation bearing on theories of age- and sex-role identification and development. Normative development was found to consist primarily of redistributions of social obligations among reference figures and social objects. However, normative cognitive structures did not generally increase in complexity (differentiation) with development. Social learning explanations accounted plausibly for some but not all findings, and there was evidence that normative development after early childhood is initiated and patterned by underlying changes in the child's thought.

The study also provided unexpected information on developmental trends in extreme response choice, here found to decrease linearly with age in both sexes and also curvilinearly (earlier) in girls than in boys. A report (in preparation) presents evidence that cognitive development mediates choice of extreme responses when categories have certain logical properties over and above a scale's ordinal property. Implications are discussed for measurement of response styles when these are known or suspected of exhibiting developmental trends.

Conceptual Complexity and Normative Social Expectations
(782-9)

Mr. Shore

PURPOSE: The intent of this study was to examine whether individuals differing in complexity of social-information processing would have differing systems of normative social expectations. "Conceptual systems theory" (cf. Harvey, Hunt & Schroder, Conceptual Systems and Personality Organization, Wiley, 1961) has predicted that individuals with a higher level of conceptual organization have at their disposal more bases for differentiating the social environment, and are more oriented toward mutual relationships (e.g., with peers) than toward dominant-submissive relationships (as toward authority figures). Thus we might expect complex individuals to base normative expectations for the self on multiple considerations, and to show less reliance on authority figures such as parents.

PROGRESS: The sample consisted of high school students of both sexes who were given an open-ended measure of conceptual complexity and W. Emmerich's social expectations questionnaire (see summary of project 782-06). For purposes of analysis the sample was divided into a low-complexity and a high-complexity group. The analysis of the self-expectations has been completed, while the analysis of the similarity of self-expectations to expectations held by others is in progress.

MAJOR FINDINGS: It was found that low-complexity individuals tend to believe they should never argue with others, in contrast to the more qualified judgments of the high-complexity group (where qualified statements can be taken as an indicator of multiple bases for judgment). Secondly, the low complexity group indicated they would ask help of parents, help parents, and agree with parents more than they would peers, whereas the high-complexity group tended to perform those actions more toward peers than parents. Thus the predictions of conceptual systems theory tended to be supported.

Creativity and Environmental Cues in Nursery
School Children (NICHHD, 782-10)

Mr. Ward

PURPOSE: This study was designed to assess the effects on creativity test performance of cues to possible responses. In earlier work on children's creativity, it appeared that children often scanned the testing environment for such cues. Such use of cues might provide a source of extraneous variation in creativity test performance, or it might represent one of the strategies by which the creative child obtains his ideas.

PROGRESS: Three creativity tests, each requiring the child to name as many ideas as he could that met a simple problem requirement, were administered to 53 nursery school children. Two of these tests were given in a typically barren experimental setting and served as the basis for dividing the sample into creative and uncreative subjects. The third was given to some subjects under the same cue-poor conditions but to others in a cue-rich testing environment--a room containing objects and pictures which provided cues to possible responses. Data collection and analysis have been completed, and a report is available (RB-68-58). The report has also appeared in Developmental Psychology, 1969, 1, 543-547.

MAJOR FINDINGS: Creativity and environmental richness interacted significantly in their effect on ideational production. Creative children gave more ideas in a rich than in a poor environment, while uncreative subjects showed no overall effect for environmental cues. It is argued that scanning the environment for task-relevant information is one of the strategies employed by the creative child in his search for problem solutions. This interaction also shows that, despite low test intercorrelations, the creativity dimension has some stability across tests and over a period of several months in nursery school children.

Motivation and Capacity in Children's Creativity
(NICHD, 782-10)

Mr. Ward
Mr. Kogan

PURPOSE: A number of studies have demonstrated that there is a dimension of individual differences in children's creativity which is reliable across a range of alternative tests and which is virtually independent of general intelligence. There is still uncertainty, however, concerning the processes responsible for these individual differences. On the one hand, children who produce more ideas in these tasks may differ in capacity from those who produce fewer; for example, their "associative hierarchies" may be larger and more richly interconnected. Alternatively, the differences may be found in motivational variables--the productive child may be the one who is more intrigued by an unusual problem, or he may simply have a greater desire to please the examiner.

This study investigates the effects of rewards on creativity test performance in an attempt to distinguish between these explanations. Reward is intended to assure, so far as is possible, that subjects will approach the task with uniformly high motivation. Then, if the variation in ideational production observed under ordinary testing conditions represents differences in effort expended, reward should eliminate, or at least reduce, the magnitude of those differences. If instead variation in productivity primarily represents capacity, increased motivation should not help the child who lacks relevant associations to draw closer to one with a larger repertoire.

PROGRESS: Four creativity tests modified from those used by Wallach and Kogan were administered to 191 fifth-grade children. In Session 1 all subjects were tested in the evaluation-free, game-like testing context that has been used standardly with these instruments. In Session 2 subjects were assigned to three treatment groups: Control children received a replication of the standard, "baseline" testing conditions. Immediate Reward children were offered one cent for each idea they gave, and were given rewards as they responded. Delayed Reward children were given one cent for each idea, but were not rewarded until the test was completed.

Analysis to date has considered only response fluency--the number of acceptable ideas given. A preliminary report has appeared as a Research Bulletin (RB-70-39) and will be presented at the 1970 meeting of the American Psychological Association. Scoring is currently in progress using a measure of response originality as the criterion for investigation of reward effects.

MAJOR FINDINGS: Preliminary analyses determined that there were no systematic differences associated with the order of testing (tests were counterbalanced to guard against practice effects) or with sex of child. The various creativity tests were highly intercorrelated and were independent of IQ. The main analysis is an analysis of covariance, regressing performance in reward conditions on baseline creativity. This analysis showed that reward had no effect on the slope of the regression, but it led to an increase in mean number of ideas for children at all levels of baseline creativity. It can be concluded, so far as response fluency is concerned, that a change in the motivational state with which the child approaches the task is not sufficient to eliminate or decrease individual differences in creative performance, and therefore that those differences represent primarily capacity rather than motivational differences among children.

Rate and Uniqueness in Children's Creative Responding
(NICHHD, 782-10)

Mr. Ward

PURPOSE: Mednick's theory of creativity, with its interpretation of individual differences in creativity as differences in "associative hierarchies," gives rise to several testable hypotheses concerning the intra- and inter-individual variation in the sequence of ideas to be expected in a test of creative production. This study provided a test of these derivations from the associative theory of creativity in elementary school children, and an opportunity to compare results with young children to those previously obtained with college student subjects.

PROGRESS: Three ideational fluency measures were administered to 34 seven- and eight-year-old boys. Data collection and analysis have been completed, and a report is available (RB-68-36, and Child Development, 1969, 40, 869-878).

MAJOR FINDINGS: In agreement with findings on college students, response rate decreased, and average uncommonness of responses increased, over time; subjects who eventually produced more ideas gave them at a higher rate. Creative children (those having high response fluency) did not differ from uncreative ones in the rate at which their successive responses became less stereotyped. The possibility was raised that children identified as creative differ from others solely in personality and motivational, rather than ability, characteristics.

Cognition of Affect (NICHHD, 783-2)

Mr. Messick

PURPOSE: This study investigates individual differences in the conceptual differentiation of affects as a function of cognitive styles and ideological commitment.

PROGRESS: Several measures of cognition and personality have been administered to over 600 high school students along with a task in which they were asked to judge the degree of similarity or difference among 18 affect names, such as fear, surprise, joy, and contempt. These judgments of similarity are being analyzed by multidimensional scaling procedures to isolate consistent individual viewpoints about affect interrelations. The number of stimulus dimensions and other structural properties of each viewpoint will be used to assess consistent individual differences in the conceptual differentiation of affects. The content of the stimulus representation for each viewpoint will be used to characterize the cognition of affect according to that viewpoint. Individual differences in conceptions of affect will be studied in relation to the cognitive and personality measures included in the battery, but in particular to measures of skill in discriminating and identifying visually displayed affects, the spontaneous tendency to characterize photographs of faces in affect terms, choice of preferred affect, and ideological polarity. The scoring of these procedures is currently in progress. (Study done in collaboration with S. S. Tomkins, City University of New York.)

Test Anxiety Study (NICHHD, 783-4)

Mr. Bloxom

PURPOSE: Factor analytic studies have shown test anxiety to be multi-dimensional. A subject's anxiety can be elicited by any or all of a variety of aspects of the test situation, e.g., the subjective importance of the test and how well prepared he is for the test. The present study considers a number of such aspects. For each aspect, subjects who respond anxiously to that aspect are compared with other subjects with respect to (a) scores on conventional test anxiety measures and (b) performance in testing situations.

PROGRESS: A study of 130 students at a New Jersey college has been completed and is reported in RB-68-30. The data for a follow-up study, using another sample, has been analyzed. The follow-up study will be reported in a forthcoming Research Bulletin.

MAJOR FINDINGS: Subjects were found who respond differentially to important vs. unimportant tests. On subjectively unimportant tests they report feeling little anxiety and appear to perform poorly. Other subjects were found who feel anxious on both important and unimportant tests and who, as a group, perform neither better nor worse than other subjects. The follow-up study investigates a greater number of test dimensions than did the initial study. How well prepared a person feels for a test contributes, more than other test dimensions, to tension felt in a test. Preparedness also interacts with the typical level of school performance and with global test anxiety in determining tension felt in a test.

Dimensions of Conformity (NICHHD, 784-1)

Mr. Stricker
Mr. Messick

PURPOSE: This study (a) examines the usefulness of individual differences in ratings of desirability in predicting an independently defined behavioral variable, conformity; (b) investigates the relationship between desirability judgments and self-descriptive responses to parallel forms of personality scales; (c) clarifies the relationship between acquiescence and social desirability (SD) response styles and conformity, a trait which these response styles are believed to reflect; and (d) appraises the dimensionality of responses to diverse conformity situations.

PROGRESS: Pilot study data were used to construct response-style scales based on attitude content and to develop paper-and-pencil and small-group behavioral measures of conformity. Conformity was measured in an Asch situation (counting clicks and answering attitude items) and by questionnaires with fictitious norms (estimating probabilities of events and answering attitude items). The needed personality scales were adapted from existing ones, and all the necessary data were collected from high school student volunteers. Part of the statistical analysis has been completed; the rest is under way.

MAJOR FINDINGS: Many subjects suspected that the purpose of the conformity procedures was to determine whether their responses would be influenced by others, and that the feedback they received about other subjects' responses was wrong. The suspicion variables were highly interrelated and, in general, negatively related to conformity measures. Correlates of the suspicion variables included acquiescence and social desirability response styles, ascendance, self-esteem, and intelligence. A report is published in the Journal of Personality and Social Psychology, 1967, 5, 379-389.

Self-reports and judgments were compared on five personality scales. With a few striking exceptions, the two kinds of measures were generally unrelated, or even negatively related, and they had markedly different patterns of correlations with the conformity measures. These correlations were mediated by the subjects' suspicions about the conformity procedures. Response styles and intelligence did not produce the differential functioning of the two kinds of measures and did not moderate the relationship between them. A report is published in the Journal of Experimental Research in Personality, 1968, 3, 151-167.

The dimensionality of responses to the four conformity procedures and their generality across situations was examined. Conformity, anticonformity, and independence scores on each of these four procedures were factor analyzed, separately for the suspicious and unsuspicious subjects. Conformity and anticonformity appeared to represent one bipolar dimension, and conformity and independence seemed to involve another bipolar dimension. These responses were not consistent over procedures; the devices functioned differently, particularly for the unsuspicious subjects. A report is in press in the Journal of Personality and Social Psychology. (This study is being done in collaboration with Dr. Douglas N. Jackson of the University of Western Ontario.)

Determinants of Risk Taking for Others
(NICHHD, 784-4)

Mr. Kogan
Mr. Teger

PURPOSE: The present research represents an extension of earlier work by Zaleska and Kogan (RB-69-9) on the comparison of individual and group decision-making for other people. In one study, the intention is to find out whether there is a stable norm requiring diminished risk for others, and if so, how group interaction and the sequence of decisions for self and other affect this norm. The second study examines the effects of friendship and reciprocity of decision-making between self and other on preferred risk levels.

PROGRESS: Data analysis has been completed for both studies, and a report is currently in preparation.

MAJOR FINDINGS: The first study (carried out with males at Lafayette College and females at Rider College) has demonstrated that the sequence of choosing for self and others is immaterial. Whether individual choices for others are made before or after individual choices for self, more caution is displayed for others than for self. In the second study (carried out with Douglass College females) decision-making for others was not affected by extent of friendship between the decision maker and the other. On the other hand, a significant reciprocity effect was obtained. In deciding for another, subjects were inclined to take greater risk under nonreciprocal conditions than in the case where the other would in turn be deciding for the decision-maker herself.

The Effect of the Pretest on the Risky Shift Phenomenon
(784-4)

Mr. Teger
Mr. Kogan

PURPOSE: The finding that groups take greater risk than individuals has always been studied in a within-group design. The purpose of the present study was to examine the effect in a between-group design. If the risky shift does not occur in the between-group design we might then conclude that the risky shift is produced only when group members have the opportunity to study the problem before the group discussion.

PROGRESS: Data have been collected at the University of Pennsylvania. Additional data are currently being gathered.

MAJOR FINDINGS: The initial results indicate that the risky shift will occur in between-group as well as in within-group designs.

Motivation and Performance in Adult-Evaluative
and Peer-Competitive Contexts (NICHD, 784-4)

Mr. Kogan

PURPOSE: In the last 15 years there has been a growing body of research into motivational factors in achievement in both the classroom and other situations. Such research has been possible because of the development of useful measures of achievement motivation. Although psychologists have long recognized the influence of the interpersonal context upon the individual's striving and performance, there has been little research on the specific effects of such contexts. The principal aim of this study is to examine the impact of two commonly occurring contexts--adult-evaluative and peer-competitive--on the achievement motivation and performance of elementary school boys.

PROGRESS: A total of 370 fifth- and sixth-grade boys in the Princeton School System have been tested for need Achievement, need Affiliation, test anxiety, and defensiveness. Of that number, 168 boys varying in "hope for success" and "fear of failure" have performed on a shuffleboard risk-taking task. Analysis of the data has been completed and a report is currently in preparation.

MAJOR FINDINGS: On the whole, the results in both the peer-competitive and adult-evaluative contexts conformed to Atkinson's motivational model of risk taking--i.e., a preference for intermediate risk taking in "hope for success" subjects and a preference for more extreme risk or caution in "fear of failure" subjects. Of further interest was evidence showing significant variation in risk levels across contexts for high defensive boys--more cautious under "adult evaluation" and more risky under "peer competition"--and the absence of such variation for low defensive boys. (Project conducted in collaboration with Mr. J. Damm of the University of Queensland, Australia.)

Observation of Prosocial Behavior (NICHD, 784-5)

Mr. Rosenhan

PURPOSE: This study is concerned with the social conditions that lead to internalization of prosocial norms. Children joined a model in a bowling game, in which each time the model obtained a high score he took two rewards and contributed one to charity. Subsequently, the model departed and the child was left to play by himself. We observed the conditions under which the child would contribute to the charity in the absence of adult pressure (internalization).

PROGRESS: Data have been collected from several public school populations. Three reports are currently available; others are in preparation.

MAJOR FINDINGS: In the first study control subjects, who did not observe a model but were instructed that they could donate if they so desired, failed to donate, suggesting that permissive teaching is of little avail for this kind of behavior. Of the children who observed the model, primarily those who donated in his presence donated also in his absence. Prior relationship with the model had indeterminate effects on giving and requires further examination. Subsequent studies have attempted to assess the separate and combined effects of direct instruction to donate, observation of a donating model, and opportunity to rehearse on internalization of the charitability norm. Direct instruction alone tends to elicit high levels of charitability, but these deteriorate rapidly in time. Observation of others, combined with rehearsal, remain powerful determinants of stable altruistic behavior. (White, G. W., Doctoral dissertation, Princeton University; RB-67-27.)

There appear to be individual differences in the capacity of adult models to elicit internalized charitability in children. The bases of these differences have not yet been ascertained.

Acquisition of norms of charitability appears to have age-developmental characteristics. The variety of educational techniques and conditions that appear quite successful with fourth- and fifth-grade children appear to have little effect on first graders. Notions of "moral readiness" are being applied to these data, though other interpretations are equally plausible at this juncture. (Rosenhan & White, Journal of Personality and Social Psychology, 1967; RB-66-50.)

Current work concerns the age and sex of the model, the nature of the reward, and the teaching conditions that facilitate or retard generosity in children. A summary of this work on "Some origins of concern for others" (RB-68-33) has appeared in P. H. Mussen, J. Langer & M. Covington (Eds.), New Directions in Developmental Psychology. New York: Holt, Rinehart & Winston, 1969, and as "The Kindnesses of Children," Young Children, 1969, 30-44.

Cognitive Styles and Attitudinal Consistency
(NICHHD, 784-9)

Mr. Messick

PURPOSE: Some of the major concerns of social psychology in recent years have dealt with the dynamics of attitudinal consistency--in particular, (a) with the extent to which both cognitive and affective components of attitude systems tend to be organized in psychologically consistent patterns, (b) with the operation of motivational pressures toward consistency, and (c) with the specific mechanisms whereby inconsistency is resolved. The present study investigates the importance of reliable individual differences in the tendency toward attitudinal consistency, the generality of their operation across different measurement approaches and different response processes (such as interpersonal perception and opinion change), and the extent of their relation to other cognitive and personality variables.

PROGRESS: Attitudinal consistency was measured using four experimental procedures that had previously formed the basis for four major studies in this area: The McGuire Logical Consistency Test, the Morrisette Balance Completion Test, the Osgood and Tannenbaum Congruity Test, and the Rosenberg and Abelson Fenwick Test.

These four experimental procedures were administered, along with a measure of intolerance of attitudinal inconsistency, to a sample of 200 high school seniors who had been extensively tested earlier with a battery of cognitive and personality measures. One ancillary function of the present study will be an evaluation of the replicability with high school students of the mean effects observed in the four previous experiments by Morrisette, McGuire, Rosenberg and Abelson, and Tannenbaum. The major emphasis, however, is upon the consistency of interrelations among these four procedures, upon the number and nature of dimensions required to account for individual differences in attitudinal consistency, and upon the cognitive and personality correlates of those dimensions. Particular attention will be paid to the relations between categorizing styles and attitudinal consistency, since level of conceptual differentiation and cognitive complexity may moderate consistency pressures. (Study done in collaboration with J. E. Singer of State University of New York at Stony Brook.)

A Study of the Parental Role (NICHD, 784-14)

Mr. Emmerich

PURPOSE: This study investigates several aspects of parental role functioning as judged by the parent, including valued socialization goals, beliefs on how these goals are best achieved, perceived competence in implementing child-rearing methods, and success in achieving socialization goals. The study's aims include developing an instrument that measures these variables, determining their structure, and examining their parental attitude, personality, and social structure correlates.

PROGRESS: A Parental Role Questionnaire (PRQ) was developed and administered twice to 103 middle-class parents of children attending a university nursery school. Measures of parental attitudes (PARI) and personality (16 PF) were also secured. Findings are summarized in RB-69-65 and fully reported in Emmerich, W. The parental role: a functional-cognitive approach. Monographs of the Society for Research in Child Development, 1969, 34(8, Serial No. 132).

MAJOR FINDINGS: Analyses determined both the structure of individual differences and cultural patterns. The PRQ measures were reasonably stable, accounted for distinct portions of the individual-difference variance, and defined four independent factors having meaningful PARI and 16 PF correlates. Parents reporting variations in capacities to implement child-rearing techniques as a function of the socialization goal (parental inconsistency) also exhibited signs of maladjustment. PRQ attributes signifying lowered competence in parental role functioning were associated with authoritarian parental attitudes. Parental reports of problematic child behaviors were independent of valuational judgments; e.g., trustingness in the child was highly valued but not problematic; obedience was both valued and problematic, and independence was problematic but not highly valued. The findings pointed to a characteristic preschool crisis based upon the child's transition to greater independence during this period. Changing the child's situation was seen in principle as an effective child rearing technique, but parents felt limited in implementing this approach. Nonintervention was seen as an ineffective parental response toward children of this age. Parents favored direct interventions to foster desirable attributes in the child, but they favored indirect methods for decreasing undesirable child behaviors. Sex of parent and child influenced some patterns, but not markedly. There were family variations in patterning based upon factors other than child sex.

Social Stratification (NICHHD, 784-16)

Mr. Stricker

PURPOSE: A vast amount of research has been devoted to the identification and development of objective indexes of social stratification, such as education and occupation. Although this research has been based almost entirely on samples of whites, these indexes have often been used to measure the stratification of Negroes, despite suggestions that these indexes are not comparable for the two groups.

An inherent problem with these indexes, even when they are restricted to whites, concerns the identification of the cutting points for differentiating between the social classes. Empirical attempts to identify these points have largely been unsuccessful and a theoretical controversy continues over whether the social classes are distinct entities, reflecting discontinuities in stratification, or are arbitrary classifications that have been imposed on a continuum.

This study has two aims: (a) to identify the dimensions of social stratification for both Negroes and whites, and the indexes that best reflect these dimensions, and (b) to determine whether distinct social classes exist and, if so, whether they can be empirically differentiated.

PROGRESS: A comprehensive, highly structured interview schedule was prepared, focused on information that directly reflects the major aspects of social stratification or are important correlates of it. The schedule was used in household interviews with representative samples of Negro and white household heads in a typical northern city. The data are being analyzed.

Values: Their Nature, Development, and Consequences (NICHHD, 785-2)

Mr. Alker

PURPOSE: This study tests the hypotheses that both value stability and value change can be explained in terms of the purposive organization of value-relevant choices. To test the hypothesis concerning value change, longitudinal data are required. Both changes of means to ends and ends to means are expected. The stability hypothesis may receive demonstration if analysis of the choices in terms of their purposive organization serves to predict future behavior more satisfactorily than other more fashionable methods of data analysis.

PROGRESS: Data analysis is not yet complete as new computer programs have been required.

Training of Cognitive Functions in
Children (NICHD, 786-1)

Mr. Jacobs

PURPOSE: A procedure is being developed to train the inductive reasoning ability of children. It will be used to investigate the increments in ability possible at different age levels and different initial ability levels.

PROGRESS AND MAJOR FINDINGS: The double-classification problem forms the basis of many intelligence test items, and is of major interest in Piagetian theory. The solution of such a problem requires S to take into account simultaneously two different aspects of stimulus variation (e.g., size and shape) while inferring a logical relation. Two previous studies attempted to increase the scores of first-grade children on Raven's Coloured Progressive Matrices, a test that includes many double-classification items. The rigorously prescribed training procedures used resulted in a temporary item-specific effect (1966 Proceedings of the 74th Annual Convention of the American Psychological Association, pp. 263-264), and a heightened response set (Perceptual and Motor Skills, 1968, 27, 759-766). The insights gained in these studies suggested that more general and lasting improvement in the skill of handling double-classification problems could be obtained by altering certain features both of the training and of the criterion.

As a by-product of the two above studies, it was found that a score based on type of distractor chosen on the CPM test has a moderate degree of test-retest reliability, concurrent and predictive validity, and cross-cultural applicability (Psychological Reports, 1970, 26, 311-315).

A new training procedure was developed that allowed for more individualization of instruction and involved more verbalization. Coloured Progressive Matrices was replaced by a new test of double-classification skill which (a) used shapes which children could label easily as the elements of each matrix, (b) was constructed in three randomly parallel alternate forms, and (c) permitted the measurement of transfer along specifiable dimensions. Experimental Ss scored significantly higher than control Ss on both learning and transfer tests, both immediately and when tested for retention four months later (RB-68-65, with M. Vandeventer, accepted for publication in Child Development).

The general methodological questions involved in relating training operations to operations used to measure transfer are discussed in "Evaluating the training of intelligence." This paper maps out a universe of relations within which transfer could be assessed more meaningfully (RB-69-20, with M. Vandeventer).

A subsequent research study (1) assessed transfer within this universe, (2) evaluated the effects of more extensive training, and (3) investigated the effectiveness of different trainers. As in the earlier study, trained Ss significantly outperformed control Ss on shape and color matrices. Their superior performance also transferred throughout the universe of relations. More extensive training produced significantly more transfer than regular training. There was no difference in the effectiveness of the two trainers (RB-69-88, with M. Vandeventer).

A study now in progress assesses transfer across operations as defined in Guilford's Structure-of-Intellect model.

Learning to Formulate Original Responses in Relation
to Anxiety and Defensiveness (NICHHD, 786-10)

Mr. Frederiksen
Mr. Evans

PURPOSE: A previous study (RB-68-63) showed that the number of responses to a task requiring subject to formulate original responses (the Formulating Hypotheses test) was increased by a training procedure involving feedback; but the number of "acceptable" responses was not increased. Number of responses was found to be negatively related to verbal ability and curvilinearly related to test anxiety, with a significant interaction between test anxiety and verbal ability. The purpose of the present study is (1) to attempt to replicate and extend these findings, using dependent measures that better reflect quality as well as quantity of responses, (2) to compare the results of two kinds of feedback, one that emphasizes quantity and one that emphasizes quality of response, and (3) to investigate sex differences in performance under these experimental conditions.

PROGRESS: Data have been obtained and the scoring of protocols is nearing completion.

Are Bayesian Optimal Decisions Artificially Intelligent?
(NICHHD, 786-12)

Mr. Alker
Mrs. Hermann

PURPOSE: Claims have been made that humans, in comparison with Bayesian formulas, are essentially conservative in extracting the maximum permissible certainty from probabilistic information. Two alternative hypotheses concerning observed discrepancies between human subjects and Bayesian formulas are considered: (1) the Bayesian model simulates well the information processing of intelligent, abstract, rational, nondogmatic subjects. Unintelligent, concrete, irrational, dogmatic subjects, with demonstrated difficulties in processing probabilistic information, on the other hand, will exhibit the expected reluctance to revise their opinions in the light of new information, (2) applying the Bayesian formulas to complex, important human decisions oversimplifies those problems thus accounting for humans' apparent conservatism.

PROGRESS: An initial report of the findings was presented at the 1967 APA meetings. The final report is available (RB-70-27).

MAJOR FINDINGS: (1) No individual difference variable of previously demonstrated relevance to accuracy in processing probabilistic information related to conservative deviation from optimal Bayesian value. A measure of risk-taking preference also was unrelated to this purported human conservatism. (2) A manipulation of problem type, which subjects reported successfully, increased the importance and complexity of the problem, increased subjects' deviation from optimal Bayesian performance in a conservative direction. The negative findings from (1) and positive findings from (2) suggest not that humans are inherently conservative but rather that Bayesian formulas, as simulations of human decision making, are inherently risky.

Factors in Comprehension of Verbal Material
(NICHHD, 786-14)

Mr. Carroll
Mr. Freedle

PURPOSE: From its inception, this project has been envisaged as a program of separate studies to determine various parameters in the comprehension of discourse and in the learning of facts, concepts, and principles from such discourse. Particular attention would be paid to the role of lexicon and syntactical structure. Although some of the work would be done with native speakers of English responding to oral and written discourse in English, studies would also be concerned with the comprehension of discourse in the learning of a second language in order to examine the development of comprehension in detail. Also, comprehension ability would be studied developmentally by conducting experiments and tests with individuals sampled from different age levels, particularly the years of schooling.

PROGRESS: Three studies were conducted: (1) "Children's imitations of sentences evaluated by four response measures" (Mr. Freedle, Mr. Keeney, and Mrs. Smith). This study sought to determine whether the tendency of young children (pre-school age) to produce what has been called "telegraphic speech," i.e., sentences from which function words and grammatical inflections are generally missing, is due to selective inattention to these elements during original presentation of sentences to be imitated or to deletion of these elements during production of the imitation. Apparently, the latter explanation is more correct; the function words and inflections are processed but tend to be dropped in imitation. The results were presented at the 1969 APA convention (Proceedings of the 77th Annual Convention of the American Psychological Association, 1969, 47-48). A Research Bulletin (69-79) was issued on the study and was later published in the Journal of Verbal Learning and Verbal Behavior, 1970, 9, 149-154.

(2) "Observations with self-embedded sentences using written aids" (Mr. Freedle and Mrs. Craun). Although syntactic rules of English allow for the construction of self-embedded sentences of any degree, language users typically find such constructions "ungrammatical" and difficult to understand. This study examined the possibility of using special "aids" that would guide the Ss into discovering the syntactic and semantic relationships in a self-embedded sentence. Ss who received these aids achieved close to perfect scores on comprehension while Ss who did not tended to get scores close to the minimum possible. This study is available as RB-69-22, and has been published in Perception and Psychophysics (1970, 7, 247-249).

(3) "Some interrelations among nouns: the pursuit of semantic markers" (Mr. Freedle). Hierarchically-organized semantic markers have been suggested as among the minimal elements needed in the understanding of sentences. However, critics have pointed out that the hierarchy may not be well-founded linguistically. The present studies showed that the hierarchies formed by subjects in a word-grouping task fell into two distinct groupings, suggesting that hierarchies, if they exist in any sense, differ from individual to individual. A report will be published in the 1970 Proceedings of the American Psychological Association.

Work on this project has also included a continuation of the planning and literature survey activities undertaken by Mr. Carroll, in close connection with Project-Job 775-1, "Learning from Verbal Discourse in Educational Media."

Simulation of Learning Processes in a Restricted Set
of Experiments from the Literature (NICHHD, 786-15)

Mr. Carroll

PURPOSE: It is becoming clear that the number of variables that may be involved in any given learning situation and the number of basic learning paradigms that may apply are so large that any complete analysis of learning situations could only be done by complex computer programs. The goal of this research is to fashion a taxonomy of learning processes such that the outcomes of learning situations can be more adequately predicted and controlled, and to test this taxonomy by applying it to clusters of learning experiments reported in the literature.

PROGRESS: Relatively little time has been devoted to this project in the past year. Data from experiments conducted by Calvin Nodine, designed to investigate the temporal parameters of paired-associate learning, still await final analysis; until this analysis is complete, it will be difficult to develop appropriate simulation models. The work on a generalized scheme for coding the designs of various types of verbal learning experiments also remains incomplete. However, a computer simulation was developed for an experiment that was published by W. K. Estes (1969) on the relative effects of knowledge of results and reinforcement in a verbal discrimination task. Data were collected on the performance of a number of subjects in the time-sharing, "on-line" computer version of this program in order to refine the simulation.

Application of the Lognormal Model of Word
Frequency Distribution (NICHHD, 786-16)

Mr. Carroll

PURPOSE: In previous work, it was demonstrated that the lognormal distribution yields good fit to word frequency distributions when account is taken of the bias in drawing finite samples from a theoretical population. The lognormal theory makes possible the estimation of the type-token function and the vocabulary size underlying a given sample. The research aims to explore the application of the lognormal model to various types of samples in order to aid in the characterization of individual differences in verbal ability and the description of samples of verbal material.

PROGRESS: The major accomplishment of the past year has been the final development of an apparently satisfactory rationale for the lognormal distribution as applied to word-frequency data. This work was reported in RB-69-90, and a manuscript is being prepared for submission to an appropriate publication medium.

The development of this rationale passed through several phases. First, an investigation was made of the properties of a so-called "logbinomial distribution" which provided reasonably close fits to empirical data. The logbinomial distribution, however, was seen to be too limiting, and a way was found to generalize it to an asymptotically lognormal distribution that provided more satisfactory fits. The rationale was developed by supposing that the probabilities at the nodes of decision trees are symmetrically distributed around .5 with a certain variance. By the central limit theorem, the logarithms of the continued products of probabilities randomly sampled from such a distribution would have an asymptotically normal distribution. Two mathematical models incorporating this notion were developed and tested: in one, the number of factors in the continued products were assumed to be fixed, while in the other, that number is dependent upon a Poisson distribution. Psycholinguistic processes in the generation of words in free association and in continuous text were postulated in such a way as to correspond to the model. Reasonable fits were obtained to several sets of data, although there remain certain problems in estimating the parameters of the distributions. In any event, it is considered that the rationale provides, in principle, a satisfactory explanation for the finding of approximately lognormal distributions in word-frequency data. This lognormal theory in effect supersedes the rank-frequency law proposed by G. K. Zipf some years ago.

Work has continued on the application of the lognormal theory to new sets of data, and associated computer programs have been converted for use with the IBM 360/65.

The rationale for the asymptotic lognormal distribution has certain resemblances to a theory of retrieving words from memory developed by R. C. Oldfield (1966), but it also has differences. In order to explore the implications of the present rationale, data collected by Oldfield and also by Carroll--on subjective magnitude estimates of word-frequency and naming-latencies--have been analyzed. Tentatively, it appears that naming latencies need to be scaled logarithmically in order to provide optimal predictions from logarithmic word frequencies. However, more data need to be collected to confirm this finding and to provide a more solid basis on which to evaluate the competing theories.

Studies of the Acquisition of Grammar in
a Foreign Language (NICHHD, 786-17)

Mr. Carroll

PURPOSE: The basic problem is to analyze how the foreign language learner acquires competence in the grammatical structure of the language, and to resolve possible conflicts between two types of theory concerning this process--the "audiolingual habit" theory and the "cognitive code-learning" theory.

PROGRESS: During the period covered by this report, progress has been held up because of activities on other projects.

Generalizability of Cognitive Styles (786-18)

Mr. Cahen

PURPOSE: The purpose of the research is to study different areas of cognitive style and to develop theoretical models and techniques for assessing group as well as individual behavior in these areas.

PROGRESS: Data are being analyzed from an administration of Kagan's Matching Familiar Figures Test. The data were obtained under two conditions. The first condition obtained measures where the students were asked to select a distractor which was the same as the presented stimulus. The second administration was obtained under conditions where the students were asked to pick a distractor that was different from the stimulus. Measures of response latency and errors under the two conditions are being examined and compared. A preliminary analysis of the data indicates that the dimension of latency is more stable within and across measures than the dimension of errors. Additional MFF data from other sources and investigators are being gathered and analyzed to check the stability of the measures of latency and errors.

Additional sets of MFF data have been obtained from three investigators in the United States and Canada. These data are being analyzed for the relative contribution of latency and error to the construct of impulsivity.

PURPOSE: The goal of this project is to establish an axiomatic basis for the analysis of behavior generated in a variety of experimental settings such as paired-associate learning, human probability learning, syntactic and phonemic recognition studies, and more general psychophysical sensory discrimination studies. Establishing the lawful relations among stimulus presentations and their associated responses will serve as a basic step in designing and analyzing more complex studies in human learning and cognition.

PROGRESS: Three approaches to the problem of choice behavior are now in progress.

(1) The analysis of synthetic asymmetric confusion matrices using a modified input to the Shepard-Kruskal computer scaling program indicates that this program will recover the specially constructed "double" configurations which are asserted to account in part for asymmetric matrices. Application of this modified program to phonemic recognition data suggests that the distinctive features of "nasality" and "voicing" are either partially attenuated or are totally lost (i.e., not sampled) on a proportion of the experimental trials thereby contributing to the observed asymmetry of the data matrices. An analysis of asymmetry in syntactic recognition is available as RB-70-40. The study on phonemic recognition is still in progress.

(2) General Choice Theory

a. Luce's choice axiom, when it is recast in terms of proportion of time spent in making, say, manipulative or observing responses, appears to provide one way to study its applicability to an infant's attentional behavior and also provides a means of indirectly determining whether the infant perceives subgroupings of specially constructed multidimensional stimuli. This study is available in Developmental Psychology, 1970, 2, 129-133. A second theoretical paper is available as RB-69-89 and will appear in Developmental Psychology (in press).

b. A second aspect of general choice theory concerns a modification of Luce's theory in a different direction from that above. This revision deals with a quantitative account of the effects of "irrelevant" stimuli and anchor stimuli on response probabilities for choices made from the available set of responses. A paper on this topic was given at the Psychometric Society Meetings held at Stanford University, March 21-22, 1970.

(3) Human Probability Learning. Two studies testing an assumption concerning the subject's memory of the last k events and the effects this information exerts on his subsequent choices were conducted. A paper dealing with this result is available as RB-69-4. The results of the second study were presented at the Mathematical Psychology Meetings, Stanford University, August 28-29, 1968.

MAJOR FINDINGS: The analysis of several asymmetric matrices has suggested that the probability of creating dimensional information which is not present in a stimulus is significantly smaller than the probability of losing dimensional information which is present in a stimulus. Also the probability of not sampling stimulus cues dealing with syntactic structure leads to asymmetric matrices.

The evaluation of the memory assumption for k events (an assumption made in a learning model known as the k-span learning model) indicates that a subject performs best on patterns of k events which involve few runs and performs worst on patterns involving many runs (with the exception of those patterns which involve a regular alternation of events). This indicates that modifications of the k-span model which reflect the results of the above studies are called for.

The more general choice theory dealing with the effects of "irrelevant" stimuli on choice probabilities indicates that a better fit can be obtained within the current theory as compared with Luce's choice axiom; however, in addition, it is shown that the mathematical structure of Luce's choice equations are obtainable as special cases of the general choice model.

Attention Distribution as a Function of Complexity
and Incongruity in the 24-Month-Old Child
(NICHHD, 786-21)

Mr. Lewis
Mrs. Wilson
Mrs. Ban
Mrs. Baumel

PURPOSE: In the study of novelty or incongruity, most recent experiments have manipulated elements of the human face. In like manner the study of complexity has usually utilized number of checkerboard, squares or turns, of random shape. The present study was interested in manipulating incongruity of the whole human form and at the same time observing the effects of complexity. Theoretically, attention distribution should be affected by both these manipulations such that both incongruity and complexity should produce increased attention.

PROGRESS: Sixty children, 30 girls and 30 boys, each 25 months of age (+ 2 weeks) were used as subjects and were seen as part of a larger longitudinal study of attentional processes. Each child was presented 4 different visual arrays, each array presented 4 times in random order. Each of these 16 trials was 30 seconds long with a 30-second intertrial interval. The four visual stimuli were a figure of a man (M), three figures of the same man standing side by side (3M), the figure of a man with his head upside down (UM), and a figure of a 3-headed man (3H). All of these stimuli were photographs and differed only in the elements under investigation.

Six different measures of attention were observed. These were fixation time, cardiac response, amount of arm movement, smiling, pointing and vocalizing. Except for the cardiac data, the measures of attention were observed by two experimenters who showed high reliability.

The results indicate that these various measures of attending show high agreement such that when a child attends, he shows the following responses: he shows long fixation times; decreases in heart rate, arm movements and vocalizations. Moreover, he shows an increase in smiling and pointing behavior. These results are consistent with other research on attentional processes.

The comparison of 3M to M would determine the effect of complexity where complexity was defined as number of elements. Such a comparison revealed that the more complex stimuli produced greater attentive behavior.

The comparisons of M to UM and 3H to 3M would determine the effects of incongruity. The results here are somewhat ambiguous. The M to UM indicate that incongruity produced greater attentive behavior, however the 3H and 3M comparison failed to show any difference in attentive behavior.

The reason for the failure of the 3-headed man to produce more attentive behavior than the 3 men is difficult to interpret especially when the upside-down-head man produced more attention than the single man. One possibility is that for children of this age, attention to the human form is most centered around the head. If this is so, then 3 heads on one figure is not viewed any differently than 3 heads on three different bodies; however, an upside-down head is viewed differently than a regularly positioned head.

The results, using a wide variety of attention-related measures, indicate that both complexity and incongruity in a human form can affect attention distribution in the 25-month-old child. Moreover, significant sex differences in degree of relationship between measures of attention and sex differences in degree of stimulus differentiation were discussed. A report (RB-68-62) is available.

The article was presented at the Eastern Psychological Association Meeting, Philadelphia, Pennsylvania, April, 1969 and is in press in Child Development.

Attentional Distribution as a Function of Novelty
and Incongruity (NICHHD, 786-21)

Mr. Lewis
Mrs. Wilson
Miss Van Wyk
Mr. Weisman

PURPOSE: We are interested in determining if there are attentional differences to stimuli that are defined as novel as opposed to those defined as incongruous. By incongruous we mean an alteration in relatively familiar material such as a cat's head on a horse's body. By novel we mean material not experienced before. This definition of novelty is difficult to interpret in terms of real events in that a stimulus is usually multidimensional and some aspects are certain to be familiar. In the present experiment we are calling a picture of an anteater novel. From one theoretical position we could predict that familiar stimuli (cat or horse) would elicit less attention than an incongruous stimuli (cat's head-horse's body or horse's head-cat's body) and that a novel stimulus (anteater) would elicit the most. Alternative theories would argue that novel and familiar stimuli would be more equal in attention-eliciting behavior and would be attended to less than the incongruous stimuli. Because a priori classification of stimuli as novel, familiar and incongruous is difficult at best, the children's verbal labeling of the stimuli will be used. Thus, if one child responds with the word bear to the picture of the anteater, and another has no label we predict that these different verbal responses will be associated with different attentional behaviors.

PROGRESS: Fifty 3 1/2- to 5 1/2-year-old subjects have been run and the data have been analyzed.

MAJOR FINDINGS: The results suggest that attention, verbal labeling and latency to respond with a label are highly related. A Research Bulletin is in preparation.

Changes in the OR Response as a Function of
Color and Contour (NICHHD, 786-21)

Mrs. Wilson
Mr. Lewis

PURPOSE: To explore the effects of varying stimulus traits on the attentional distribution stimulus dimensions such as color and contour were viewed.

PROGRESS: Two groups of 3 1/2-year-olds were used as subjects in order to determine the effect of color and contour changes on an OR response.

MAJOR FINDINGS: Fixation, smiling and pointing data revealed that for the colored stimulus series there was less response decrement when chromatic stimuli were presented first and that there was greater response recovery when the change was to color than the reverse. For the straight and curved line series there was no difference in response decrement rate but there was greater response recovery when the straight lines were presented first than the reverse. These results are discussed in terms of stimulus intensity and stimulus saliency for the young child. A Research Bulletin 69-13 has been prepared and is published in the Journal of Experimental Child Psychology, 1969, 8(2), 296-305.

A Developmental Study of Learning within the First
Three Years of Life: Response Decrement to a
Redundant Signal (NICHD, 786-21)

Mr. Lewis
Mrs. Goldberg
Mrs. Campbell

PURPOSE: A study of learning, specifically the decrease in responding to repeated visual stimulation, was conducted systematically within the opening three years of life. To this end responses to redundant visual signals have been studied.

PROGRESS: Experiments I through IV varied both the nature of the visual signal and the number of repeated presentations while Experiment V varied the intertrial interval. The results suggest that, in general, response decrement occurs to a repeated signal. This response decrement follows a lawful developmental pattern within the first three years of life with the youngest infants showing significantly less decrement than older infants. Moreover, this response decrement-age relationship follows an almost perfect ordering by age, increasing the significance of this developmental relationship. Finally, within limits, this pattern was not affected by increasing the number of repeated trials or by changing the stimulus characteristics within the class of nonmeaningful, content-lacking stimuli.

Response decrement under these conditions was believed to represent a learning phenomenon rather than some fatigue model. Experiments VI and VII were designed to demonstrate that response decrement was predictive of and correlated to other learning phenomena. A neuronal model-acquisition learning paradigm suggested by Sokolov (1963) was thought most appropriate in accounting for the results of the present set of experiments. Alternative hypotheses were suggested and discussed. These were shown not to be as consistent with the data or as parsimonious as a model acquisition hypothesis.

Finally, data both from two new experiments and from experiments previously reported demonstrated that response decrement is correlated with and predictive of other learning tasks and individual difference variables associated with perceptual-cognitive capacity.

Thus, it must be concluded that response decrement to a redundant visual signal is a measure of perceptual-cognitive capacity, and follows a developmental pattern suggesting that model acquisition can be used as a measure of developmental organization. A Research Bulletin (RB-68-62) has been prepared and the monograph has been accepted for publication in the Monographs of the Society for Research in Child Development, 1969, 34(9, Serial No. 133).

Learning of an Alternating Stimulus Pattern in
Young Children (NICHD, 786-21)

Mr. Baskett
Mr. Lewis

PURPOSE: The purpose of this investigation was to study the orienting response to a familiar stimulus. Prior research has shown that if young children are presented a single visual stimulus over a series of trials, eye fixation, vocalization, smiling and other responses to the stimulus change in a systematic manner, generally showing a decrement in attention. However, if on a later trial a new stimulus is presented, the subject's attention will be reinstated. For this study, the two stimuli were presented in an alternating pattern (e.g., A-B-A-B-A-B) and after a series of repetitions of the stimulus pair, the sequence was broken or violated (e.g., A-B-A-B-A-B-B). This experiment was designed to ask whether or not the subject learns the stimulus in the context of prior stimuli. If the subject had learned the pattern, he would have been expected to show greater attention to the violation since he had never experienced B following B. The response measures were duration of the first eye fixation, total fixation time, smiling and vocalization as recorded by an observer and body movement which was recorded mechanically. The stimuli were two figures, one of 20 straight black lines and the other of 20 curved colored lines and both were recorded on slides.

PROGRESS: Twenty-one children, between 3 1/2 and 6 years old, were assigned to three groups of seven subjects each and individually exposed to the repeating pairs of stimuli. The intertrial interval was .5 seconds. The groups experienced either 2, 4, or 8 pairs of stimuli before the violation occurred, and then, with the violation being the first element of a new pair, either 7, 3, or 1 repetitions of the pattern respectively.

MAJOR FINDINGS: Since the data for the visual fixation was clearest, and since both smiling and vocalization were very infrequent, only the fixation data will be discussed. As a result of a large within subject variability, no significant differences were observed across trials for the three groups. Comparisons were made across the groups for the trials on which each group received its first or second violation (for all three groups) and the third and fourth violations (for two groups). The differences, tending to be significant, generally reflect the fact that for a given violation the groups had experienced a different number of trials. That is, attention was greater for those groups having experienced fewer trials. Keeping the number of trials constant, the differences on the violation trials seemed to be due to the group which had received eight violations. This group tended to be more attentive, perhaps because they received a more varied stimulus pattern. Also, this group tended to look at the violations longer than the nonviolation trials. The other two groups did not exhibit this phenomenon. One final finding was that the subjects tended to prefer the colored stimulus more than the black and white stimulus. In general, the results suggest that if the hypothesis is true about the violation of the pattern, then the effect builds up very quickly, in this case after only two repetitions of the pattern.

Longitudinal Study of Infant Attention and Its Relationship
to Subsequent Perceptual-Cognitive Development
(NICHD, 786-21)

Mr. Lewis
Mrs. Wilson

PURPOSE: This longitudinal study will investigate attentional processes during infancy and their relationship to cognitive growth in the preschool period. Specifically, the study will explore: (1) problems in measuring attention; (2) factors influencing attention, such as sex, state (awake or asleep), and clinical problems (birth trauma); (3) stimulus differences such as facial vs. nonfacial and familiar vs. novel; (4) developmental consequences of differential attention, including the relationship of attentional differences in infancy to preschool performance in concept formation tasks, learning problems, reading, and language acquisition.

PROGRESS: To explore these problems, two samples of 32 infants, 16 boys and 16 girls, were seen at 6, 13, 25 and 44 months of age. Sixteen of the subjects were also seen at 9 and 18 months. At each age level, a variety of visual and auditory stimuli were presented to the infants and a large number of response measures were taken. In addition to their response to visual and auditory stimulation, a wide variety of other behaviors were observed. These included such behaviors as concept formation, problem solving, task persistence, language acquisition, play behavior, and IQ measures.

The data, yet to be fully analyzed, will be used to explore the major areas of interest outlined below.

(a) Measurement of attention. The responses observed have been: (1) fixation (receptor orientation), (2) vocalizing, (3) crying, (4) autonomic reactivity (specifically, heart rate and respiration) and (5) gross motor activity. Investigators often harbor implicit assumptions about each of these response indices. For example, differential fixation time is often assumed to reflect a capacity for differentiation or discrimination. More significantly, absence of differences in fixation time is believed to reflect the infant's inability to differentiate among the visual patterns being presented. This inference may be fallacious, for often the infant fixates for an equal period upon two stimuli but will only vocalize or smile to one of them. Vocalizing has been assumed to indicate both a specific social response and general arousal level. Similarly, gross motor activity or heart rate acceleration is often regarded as an indicant of activity or arousal level. It is too early to comment on the validity of these assumptions, but it is clear that detailed empirical work is necessary to assess their viability. At present, it appears that each of the infant's responses viewed singly is probably ambiguous in meaning and can reflect different psychological processes. A long fixation time can occur to a familiar stimulus or to an uncertain one. Cardiac deceleration can occur when the infant studies the stimulus and is quiet, but acceleration often appears when he studies the stimulus and is active. Thus the present study intends to contribute information relevant to understanding the varied responses associated with distribution of attention to auditory or visual patterns. Analysis of six-month data indicates that attention to visual and auditory stimuli is usually associated with the following type of response pattern: receptor orientation; decrease in gross motor activity, crying, and vocalizing; autonomic responses of cardiac deceleration; and a slowing of respiration. Individual differences in this response pattern have been observed. Developmental differences in this response pattern have yet to be explored.

(b) Individual differences in attention. Marked individual differences have been found in the attentional behavior of six-month-old infants. Three types of individual differences will be explored: (1) attention span (total time attending); (2) stimulus differentiation (discrimination); and (3) habituation. Individual differences both to visual and auditory stimuli will be observed over the four age levels. Moreover, these differences will be related to other variables, including the following: (a) early mother-infant interaction as measured by an observer both in the home and in the laboratory; (b) socioeconomic level of the parents; and (c) physiological factors such as birth condition as measured by Apgar Score and birth records.

(c) Stimulus differences in attention. Because a variety of visual and auditory stimuli were presented at each of the four age levels, it will be possible to explore the influences of different stimuli on attentional behaviors. Both visual and auditory stimuli can be divided into two classes: (1) social and nonsocial, i.e., human forms, faces, or voices versus nonhuman patterns or sounds; and (2) novel and familiar, i.e., distortions of human form, syntax, and vocabulary versus their regular nondistorted forms. These two classes of stimuli were presented at all age levels and the study seeks to explore the effects of these stimulus qualities on such attentional processes as their ability to attract (length of time oriented toward) and hold (amount of habituation) the infant's attention.

(d) Relationship between attentional measures and other cognitive capacities and styles. Along with the various attentional measures to visual and auditory stimuli, a variety of other cognitive capacities and styles were observed for the one-, two-, and three-year levels. These include: (1) language tests at two and three years, (2) play behavior at one, two and three years, (3) concept formation at two and three years, (4) problem solving at two and three years, and (5) IQ scores at three years. The cognitive style measures of impulsivity and reflectivity as measured by MFF task and persistence task were given at three years. It will therefore be possible at each age level to investigate the relations among these various measures of cognitive capacity and to relate them to the attentional measures. For example, there is evidence that amount of fixation is related to play behavior at one year and that IQ scores can be predicted from attentional scores at the three-year level.

(e) Predicting cognitive capacity and style in the three-year-old from early attentional differences. One of the major aims of the study is to relate early attentional behavior to subsequent cognitive growth. It was hypothesized that early advantages in attentional ability should facilitate subsequent development. For example, infant girls appear to show significantly better auditory discrimination than infant boys, which might account for the more rapid language development in girls at later ages. It is clear that the ability to discriminate sounds successfully must precede the production of sound. Individual differences in preschool behavior will be related to early attentional differences. Preliminary results on one attentional variable indicate that the Stanford-Binet IQ score at three years of age can be predicted from the amount of habituation to visual stimulation at one year.

(f) Personality development. In the longitudinal investigation of attention and cognitive growth, several personality characteristics were assessed. Observation of individual differences in attentional behavior revealed that personality characteristics might covary with them. Personality measures obtained at the one-, two- and three-year levels were: (1) measurement of

the infant's vigor, (2) dependence behavior as measured by interaction of infant with mother or teacher, (3) sex role appropriate behavior measured in play behavior, and (4) task persistence. Preliminary observations suggest that a dependent child may spend less time looking at nonsocial stimuli as compared to social stimuli. Moreover, when left alone in a relatively unfamiliar room, his attention span might be more a function of wanting to see the mother than of interest in the stimulus being presented. It was also observed that vigorous children had more difficulty attending than placid, less vigorous ones who showed little physical activity. Analysis of the data is proceeding along all domains of interest.

The Mother-Infant Interaction in Africa (NICHD, 786-21)

Mr. Lewis
Miss Lusk
Mrs. Goldberg

PURPOSE: In our studies of mother-infant interaction we were led to believe that one of the most crucial aspects of that relationship is the contingency relationship between the infant's action and the mother's response. We have hypothesized that this contingency interaction is crucial in developing a motive of efficacy such that the infant feels that his action is capable of causing consequences.

In order to explore this we have started some pilot cross-cultural work in Senegal, Zambia, Holland and the United States.

PROGRESS: Data are currently being collected in Zambia and Senegal.

MAJOR FINDINGS: We have observed mother-infant contingency interactions and measured infant cognitive capacity with the hope of demonstrating that the stronger the contingency relationship, the faster the cognitive capacity--cognitive capacity being measured in terms of attention differences and in terms of some infant mental scales such as the Bayley.

On Relating an Infant's Observation Time of
Visual Stimuli with Choice Theory Analysis
(NICHD, 786-21)

Mr. Freedle
Mr. Lewis

PURPOSE: The purpose of this note is to outline a method by which observation time as measured by visual fixation on an object in the visual field can be predicted for n-items viewed simultaneously in the field, when the time for observing each item presented singly is known. Problems of item categorization are considered for their potential importance in inferring the perceptual-cognitive process by which an infant selects stimuli to attend to. Further theoretical work indicates that a stimulus similarity scale can be constructed using attentional measures. Also mathematical models of learning and preference behavior (as in toy-preference behavior) are under way and to date appear to give a very good fit to empirical data.

PROGRESS: A theoretical article dealing with the choice among n-alternatives is available in Developmental Psychology, 1970, 2, 129-133. A second theoretical paper on a stimulus similarity scale is available as RB-69-89 and will appear in Developmental Psychology. Research reports on learning applications and toy-preference behaviors which use a Mathematical Modeling Approach are currently in progress.

The Orienting Reflex in Infancy: An Experiential
Paradigm for Investigating Developmental Changes
in Cognitive Structure (NICHD, 786-21)

Mr. Lewis
Mrs. Baumel

PURPOSE: The theory underlying the orienting reflex construct makes little statement as to the degree of the orienting response when the repeated event is altered. It is suggested that not all discriminable changes produce the same degree of orienting reflex (OR) and that the degree of OR is a function of the salience of the particular stimulus quality.

PROGRESS: In order to demonstrate that a hierarchy of OR can be produced, 44-month-old children were used as subjects. After repeated trials of the same event, either color, size, number or form changes were introduced. The data demonstrate significantly different OR's which could not be explained either by discrimination or intrinsic value differences. It was suggested that this same procedure, applied over the first 3 years of life, would enable one to map the organism's mental structure and its change as a function of development.

MAJOR FINDINGS: OR hierarchies exist which are relevant to subjects' mental structure. This technique provides an experiential paradigm for investigating mental structure at all ages. This research was presented in a Symposium on the Orienting Reflex for the Society for Research in Child Development, March 1969, Santa Monica, California and for the International Congress of Psychology, London, July 1969.

A Review of the Literature on CNS Dysfunction and
Individual Differences in Attention (NICHHD, 786-21)

Mr. Lewis

PROGRESS: A chapter was prepared on the above subject. The chapter was divided into several sections which had the function of moving from the more general to the highly specific. The first section dealt with some broad issues surrounding the topic of attention. The second section, as a consequence of this earlier discussion, proposed some models for viewing the attentional process itself. The third section dealt with the more specific issue of the relationships between normal intellectual functioning and attention, while the last, and most specific, section dealt with CNS dysfunction in infants and children and attention. This section is concerned, therefore, with the more specific consequences of some of the broader, more theoretically oriented sections. This has been issued as RB-70-9 and will be published as a chapter in J. Hellmuth (Ed.), Exceptional Infant, Vol. 2, Brunner, Mazel, Inc.

Social Class and Sex Differences in the Attachment and
Play Behavior of the Year-Old Infant (NICHHD, 786-21)

Mr. Lewis

PURPOSE: In this experiment lower class white infants, approximately 15 girls and 15 boys, were seen in a free play situation exactly like that of Goldberg and Lewis.

PROGRESS: The report was issued as a Research Bulletin 70-13. It has been accepted for presentation at the Eastern Psychological Association meetings and has been accepted for publication by Child Development.

MAJOR FINDINGS: Response to their mothers and their play behaviors were observed. The most outstanding social class difference was that both lower class boys and girls showed significantly less vocalization to their mothers than did the middle class infants. This result suggests that the linguistic deficit in the lower class environment can be seen in the year-old infant.

Sex differences in attachment behavior were also observed and the results replicated the Goldberg and Lewis study. Girls showed greater attachment to their mothers than did boys and the results indicate that differential socialization in appropriate sex role behavior is consistent across class.

Activity and the Cardiac Response (NICHHD, 786-22)

Mrs. Darley
Mr. Lewis

PURPOSE: Some theorists believe that the cardiac response is directly related to the subject's intended transaction with his environment, such that deceleration occurs when the subject wants to "take in" information and acceleration occurs when the subject wants to exclude stimulation.

Alternatively other theorists believe that the cardiac response is one of several response systems which are inhibited when the subject attends to his environment. The theories differ in that the former holds the cardiac response control to the attentional response while the latter holds that it is only peripheral to other activity-inhibiting responses.

PROGRESS: In order to investigate this problem we are looking at data already collected and investigating fixation, activity and cardiac responses. We hope to show that partialling activity out of fixation trials results in greater deceleration than nonfixation trials. Moreover, partialling fixation out, deceleration will be greater for nonmovement than for movement trials.

The study is a first attempt at getting a fit on this important theoretical problem.

The data are currently being analyzed.

The Cardiac Response to a Perceptual Cognitive
Task in the Young Child (NICHD, 786-22)

Mr. Lewis
Mrs. Wilson

PURPOSE: It has been argued that an important determinant of the cardiac response is the subject's intended transaction with his environment. The present study was designed to investigate whether cardiac deceleration would accompany the solution of a perceptual discrimination problem, and, moreover, whether the degree of cardiac deceleration would be related to the accuracy of the response.

PROGRESS: Fifty-one subjects, 44 months of age, were each given 20 trials of a matching figures task. This task required that S match a figure (called standard) to one of four variations (one of which was identical to the standard). ECG was continuously recorded along with the latency and the accuracy of the response. If the first response was incorrect, S was asked to choose again.

The results indicated four major findings. (1) There was a significant cardiac deceleration from the time S received the standard until he made his first choice. If the first response was correct, the cardiac rate, within 1-3 beats, returned to resting level; however, if S was told to guess again, the cardiac rate remained decelerated. (2) Correct responses were associated with significantly greater cardiac deceleration than incorrect responses; however, both accuracy of response and amount of deceleration were correlated with response time. (3) In general, the degree of cardiac deceleration was significantly correlated with general intellectual function as measured by a standard IQ test. (4) There were important and consistent sex differences in cardiac responsivity.

The results of this study suggest that for the very young female child, autonomic responsivity, specifically cardiac deceleration, is directly related to S's efficiency both in terms of her general intellectual functioning and her specific performance--the accuracy of her response.

A paper was presented at the Eighth Annual Meeting of the Society for Psychophysiological Research, Washington, D. C., October 1968, and was published in Psychophysiology, 1970, 6(4), 411-420.

Cardiac Responsivity to Tactile Stimulation
in Waking and Sleeping Infants (NICHD, 786-22)

Mr. Lewis
Mrs. Goldberg
Mrs. Wilson

PURPOSE: The role of state in determining a psychological or physiological response is not disputed. However, few studies using neonates and young infants have paid much attention to this variable. This study was designed to investigate state differences in the newborn's cardiac response to a tactile stimulus. Two problems were investigated: (1) in observation of the cardiac response to stimulation, have age and state been confounded, and (2) are there differences in habituation due to state when habituation is observed over a variety of cardiac response parameters.

PROGRESS: The results indicated: (1) the infant when asleep showed initial acceleration and when awake, initial deceleration. Taking the state of the organism into account, any developmental sequence in the cardiac response to stimulation has yet to be demonstrated. (2) In the present study, six cardiac response parameters were observed and it was clear that not all these measures of the cardiac response yield similar results and that the response parameter E chooses to use will determine the degree of habituation found and the nature of the response curve. (3) In general, there were differences in habituation between the waking and sleeping infant. This research was reported in an article in Perceptual and Motor Skills, 1969, 29, 259-269.

A Developmental Investigation of Resting Autonomic
Activity: Heart Rate and Variability Over the Last
Trimester of Pregnancy Through the First Year of Life
(NICHD, 786-22)

Mr. Lewis

PURPOSE: Although there is relatively little work, the data that do exist strongly suggest that characteristics of the autonomic nervous system have cognitive and personality correlates. Specifically, the cardiac response has been found to be correlated with performance on a wide variety of tasks and cardiac variability has been found to be correlated with personality characteristics. If further research supports these statements, then the cardiac response system may be a highly accurate predictor of subsequent development. This suggests that a normative study of the developmental aspects of the resting cardiac response system be undertaken.

PROGRESS: Nineteen subjects were seen at least 2 times in the last trimester of pregnancy where resting heart rate and variability of both mother and fetus were obtained. These same infants were then seen at 2, 4, 12, 34, 36, 56 weeks post-natal where these resting parameters were again obtained.

MAJOR FINDINGS: The results of the fetal and maternal data suggest strong developmental changes in these parameters over the last trimester of pregnancy and demonstrate a relationship between maternal and fetal behavior. The post-natal data also show strong developmental changes and demonstrate a consistency in their cardiac parameters from the last trimester through the first year of life. The data also indicate greater consistency for girls than boys. A Research Bulletin has been prepared (RB-69-61) and is in press in Child Development.

A Developmental Study of the Cardiac Response to an
Auditory Signal: Onset and Offset of a Stimulus
(NICHD, 786-22)

Mr. Lewis
Mrs. Ban
Mrs. Baumel

PURPOSE: The present study is concerned with the cardiac response of infants within the first year to the onset and offset of a complex musical stimulus. What different information processing is involved when a stimulus goes on than when it goes off and how should this affect the cardiac response? Moreover, what is the effect of repeated presentation of the same signal? Finally, what age differences in information processing to an auditory signal exist over the first year?

PROGRESS: Twenty children at 3, 6, 9, and 12 months will serve as subjects to a 30-second complex auditory signal. The signal is repeated six times with a 30-second intertrial interval. Cardiac response is monitored continuously. Data have been gathered for 20 3-month-old infants but are still to be gathered for most of the other infants. Preliminary analysis of the cardiac data indicate that both stimulus onset and offset produce equal cardiac response. This response is mostly a decelerative one with some acceleration usually following an initial and steep deceleration. This response appears to habituate over the six trials to stimulus onset but no habituation is observed for stimulus offset. This exciting, although preliminary, result suggests that onset and offset carry different meanings to the subject rather than just changes in energy. Data are still being gathered on the developmental issues.

Developmental Studies of Children's Incidental Learning
and Distractibility (NICHD, 786-23)

Mr. Hale

PURPOSE: This research looks at children's performance on various measures of attention. These include assessments of (a) distractibility, (b) incidental learning, and (c) dimension preference. The research examines the validity of theories which postulate developmental changes in selective attention, as measured by these paradigms. Interrelations among these measures are also assessed.

One of the major purposes of the research is the development of a measure of distractibility. The paradigm involves a short-term memory task, present under different distraction and control conditions. Various types of visual and auditory distractors are included, and differences in performance on distraction and control conditions reflect the influence of each type of distractor.

PROGRESS: Data collection has proceeded over a six-month period with individual testing of 114 kindergarten and 165 third-grade children and has recently been completed. Preceding collection of data for the major study, pilot testing was conducted to aid in developing the measures of distractibility and incidental learning (an earlier study had contributed to the refinement of the dimension preference task).

MAJOR FINDINGS: While the major data analyses remain to be conducted, preliminary analyses indicate the following results: (1) the third-grade children showed a greater amount of incidental learning than did the kindergarten children; (2) overtraining had essentially no effect on the amount of incidental learning at either age level; and (3) no age differences in overall auditory or visual distractibility were observed.

Children's Imitation of Utterances
(NICHHD, 786-24)

Mr. Keeney

PURPOSE: The course of linguistic development has been charted mainly through analyses of children's spontaneous language productions. However, if the nature of the child's underlying grammatical competence is being sought, then many other aspects of a child's linguistic behavior, such as his ability to comprehend and to imitate spoken utterances, must be investigated. If imitation involves more than simple parroting, then an analysis of the manners in which a child distorts utterances which are spoken to him may provide evidence concerning the differences between his grammatical system and that of the adult.

PROGRESS: In the initial study which was designed to investigate the value of imitation, twenty-five children ranging in age from 3:0 to 5:5 years were required to imitate six examples of each of three different types of five-syllable utterances: (a) nonsense syllable string, "Bec rin fep sims coj"; (b) word string, "Day round jump toys all"; (c) grammatical sentence, "Tall men wear long coats." The tape-recorded imitations were scored independently by three judges for the accuracy of match between the model utterance and the imitation.

The second study, undertaken in conjunction with Mr. Freedle, investigated whether the young child's (4:4 years) tendency to delete function words and inflections in his imitations was due to a failure to perceive these elements in the model utterance or to a tendency to delete these elements at the time of sentence production. Sentences which were ungrammatical solely because of the arrangement of the articles and inflections--"A girls pick a flowers" and "Girl picks flower"--were presented, along with grammatical sentences as controls, to young children for immediate imitation. If the children perceived the critical elements in the model utterances, then their imitative performance on the ungrammatical sentences should have been disrupted. If, however, the children did not pay attention to the articles and inflections in the model sentence, then all of the sentences would have been equally "grammatical" and thus imitated with equal ease.

In the third study, undertaken in conjunction with Mrs. Smith, the 4-year-old child's ability to respond to the verb inflection /ø/ and /s, z, ez/ in the third person, present tense, i.e., "hit" and "hits," was examined. The verb inflection is a cue to the number (singular or plural) of the subject of the sentence, but it is usually redundant with the cue for number which is marked in the subject itself. Only in the rare case in which the subject is not marked for number is the verb inflection critical, i.e., "The sheep jump," "The sheep jumps." Children were initially trained to use correctly an unmarked nonsense syllable as the sentence subject and were then tested in both a comprehension situation and an imitation task with full sentences in which the only cue for number was the verb inflection.

In the fourth study adults were required to imitate sentence pairs immediately after they were presented aurally. These model utterances were so complex that perfect imitation was nearly impossible. The types of errors adults committed in this task were compared with the errors children committed in imitation in the previous studies.

MAJOR FINDINGS: In the initial study it was found that the grammatical sentences were imitated more accurately than the word strings which in turn were imitated more accurately than the nonsense syllable strings. This result indicates that elicited imitation engages the language processing apparatus of the young child at least to the extent that large differences in semantic and grammatical organization are reflected in the accuracy of imitation. A full report is available (RM-69-12).

In the second study it was found that the ungrammatical sentences were disrupted in imitation when considering both the accuracy of the imitation and the latency from the termination of the model utterance to the beginning of the imitation. Thus, the "telegraphic" nature of 4-year-olds' imitations is a result not of their inability to perceive and process articles and inflections, but of a tendency to delete these elements at the time of sentence production. An analysis of conditional probabilities of errors in imitation also indicated that even at this young age the phrase and even the sentence were employed as the encoding unit rather than just the individual word. A full report is available (RB-69-79) and is in Journal of Verbal Learning and Verbal Behavior, 1970, 9, 149-154.

The third study revealed no evidence that the verb inflection in the third person, present tense was utilized as a cue for the number of the subject of the sentence. Despite initial training on the use of a nonsense syllable which was not marked for number, the children tended to respond to all sentences as if they were singular regardless of the ending on the verb. The unmarked nonsense syllable did end in a labial or dental stop--a typically "singular" ending for a noun in English--so apparently the children responded solely on the basis of the apparent number of the subject. Even with "is" and "are" as the verb, the response on the comprehension test was influenced more by the apparent number of the subject than by the number of the verb. A full report is available (RB-69-70).

In the fourth study it was found that errors in imitation were typically deletions or substitutions of adjectives rather than articles, nouns, or verbs. Both a semantic theory and a syntactic theory can account for this finding. In the former, the noun and verb express the main idea of the sentence while the adjective elaborates or qualifies this main idea. Retention of the main idea should be of primary importance, resulting in the observed pattern of results. According to a transformational syntactic theory, each adjective is introduced into the sentence with a new sentence-node, making it a distinct unit in memory, while the noun and verb are both contained in the primary sentence-node of the entire sentence, making them sub-units in memory.

Human Choice Behavior in Psycholinguistic Studies
(NICHHD, 786-25)

Mr. Freedle

PURPOSE: The purpose of this project is to examine the lawful (presumably probabilistic) relationships between the usage of a certain class of words, such as prepositions, nouns, or adjectives and the physical characteristics and situational settings of objects presented in a controlled experimental setting. Three modes of attack are currently under way all of which indicate that an adequate choice model to describe the complexity of the behavioral data must be formulated at the level of probabilistic (stochastic) models. The first study relates preposition usage in response to a variable object A which assumed a variety of positions around some fixed object B; a second study has dealt with the types of messages which subjects write in order to communicate information about a target item with respect to four other similar items in an array. This second study indicates that a probabilistic model of noun and adjective usage is definitely appropriate and furthermore provides evidence for an extension of a cognitive theory of reference due to David Olson. The third approach has constructed an information-processing model of syntactic stimuli; again, a stochastic model was seen to be necessary to provide a good fit to the data.

PROGRESS: The results of this last study are to be presented at the Mathematical Psychology Meetings, Miami Beach, Florida, Sept. 1-3, 1970. The analysis of the preposition usage study is still in progress. A report on the analysis of messages (with Philip Kingsley) is in preparation.

MAJOR FINDINGS: The application of an information-processing model to the data collected by what is known as a sentence "probe" technique has indicated that at least three stages can be identified in determining the time it takes subjects to search through short-term memory so as to give a correct response with respect to information in some stimulus sentence. The first stage was identified as the time it takes to locate in short-term memory the "probe" word position, the second stage was interpreted as the time it takes to perform the task of searching around the "probe" word in memory so as to retrieve the correct information, and the third stage was identified as a fixed time constant, the time it takes to ready the vocal apparatus and then give the response. Previous models of "probe" data have failed to give a complete account of the distribution of latencies; the present stochastic model gives a very good account of the entire set of data.

Difficulty Factors in Learning to Spell
(NICHHD, 786-26)

Mr. Cahen

PURPOSE: The purpose of this research is to identify stimulus properties of spelling words that are associated with the spelling difficulty of the words.

PROGRESS: The literature on spelling difficulties has been reviewed and published as Research Bulletin 69-72. This Research Bulletin has been submitted for consideration as a publication in a professional journal. A data bank has been built which will be utilized to identify stimulus properties of spelling words that are associated with the spelling difficulty of the words. Data (proportion of students passing a given spelling word) from the New Iowa Spelling Scale will form the dependent variables in future analyses. A set of linguistic variables has been constructed for the predictor matrix. An attempt has been made to develop an index which reflects the phonemic-graphemic correspondence in a given word. Master tapes have been received from Richard Venezky at the University of Wisconsin and from Brown University (Kucera and Francis, principal investigators). Linguistic correspondences developed by Professor Venezky will be weighted by the word frequency counts from the Brown University study. A first sample of words from the Iowa data has been drawn and analyzed. Residuals from preliminary regression analyses have been examined and additional variables have been identified which may improve the regression equations. Additional work is being spent on transformations of the data and definitions of a logit transformation on the dependent variables. Possible interactions among the independent variables are also being examined.

In a second study, an experiment was run last spring which will add information about the effect of the semantic usage of words on spelling difficulty. The experiment utilized fourth- and fifth-grade students. Two forms of the spelling test were created and administered to matched groups of students. One form contained a word in one context with the same word in another context being assigned to the second form. For example, the word listed was given in one spelling test in the following format: "The boy listed the words on his paper." The second form utilized the following sentence: "The boat listed from side to side." The spelling tests were given orally and the data are now being transcribed from tape to coding sheets and eventually will be on punched cards for analyses. Differences in proportion of students passing the two words in the different contexts will be studied to determine the relative contribution of spelling ability, the general frequency of the word in the language, and parameters of context as determined from the Lorge semantic count list on spelling performance.

Dimensions of Children's Semantic Competence
(NICHHD, 786-27)

Mr. Cahen

PURPOSE: The purpose of the research is to study children's semantic knowledge, including their knowledge of multiple meanings of words.

PROGRESS: Because of the pressure of other duties, work on this project has been temporarily suspended.

Physiological Indices of Test Anxiety (NICHD, 787-26)

Mr. I. Katz
Mrs. Darley

PURPOSE: The main purpose of the investigation is to ascertain whether children's academic adjustment difficulties are related to physiological indices of anxiety in evaluative situations. Fourth- and fifth-grade boys, identified as high and low academic achievers, will be used as subjects. They will individually be presented with a series of pictures and asked to guess the number of objects displayed in each one. Two types of instructions will be given: neutral and test-like. A heart-rate recording will be taken as an index of emotional reaction. Also, Sarason's Test Anxiety Scale for Children will be administered. Once the relevance of the heart-rate index in studying children's emotional responses has been demonstrated, it can be employed with social-class, ethnic, and various situational variables.

PROGRESS: To date, 20 pilot subjects have been run, and the data are being coded so that the preliminary results can be analyzed.

Children's Retention of Paired Associate Learning Materials
as a Function of Method of Presentation (NICHD, 787-27)

Mr. Hale

PURPOSE: It has been hypothesized that the amount of material which children retain is influenced by the extent to which interference has been created among the materials to be learned. With the use of a paired-associate learning task, the present study assessed the validity of this hypothesis, with interference defined in terms of the degree to which the pairs to be learned were intermixed in their presentation from trial to trial. Measures of retention for this material were obtained immediately following learning and one week later.

PROGRESS: A recently completed study involved group testing of approximately 180 children in each of grades 3 and 6. This study was designed to aid in interpretation of results obtained in a related study conducted during the previous reporting period.

MAJOR FINDINGS: The results of the previous study had suggested that learning of associations under conditions of low interference among items led to better long-term retention than did learning under high-interference conditions. Data from the present study are currently being analyzed.

Interrelations in Children's Learning of Verbal and
Pictorial Paired Associates (NICHD, 787-27)

Mr. Hale

PURPOSE: It has been found that children learn paired-associate tasks more easily when the tasks employ pictorial rather than verbal materials, and when the materials are concrete rather than abstract. The present study is the second in a series of investigations designed to determine the degree of interrelationship among the processes which are involved in learning materials which differ on the above-mentioned variables. Children in grades 3, 6 and 9 were given a number of paired-associate learning tasks, which involved materials which were either verbal or pictorial, concrete or abstract. Inter-correlations among learning and retention scores on these tasks were determined.

PROGRESS: Data collection involved group testing of 144 children at grades 3 and 6 and 112 children at grade 9. Analysis of the data has recently been completed.

MAJOR FINDINGS: A task involving pictorial materials was significantly easier to learn than a task involving the verbal representation of those pictures for children in grades 3 and 9 but not in grade 6. The task involving concrete words was easier to learn than a task involving abstract words for children in grades 3 and 6 but not in grade 9. The correlational analysis indicated that the task involving pictures and the task involving the concrete words representing those pictures were more highly correlated at grades 6 and 9 than at grade 3; for all other pairs of tasks, the correlations remained relatively constant across grade levels. This result is consistent with evidence from an earlier study and is interpreted to suggest that the processes by which children learn the picture and concrete word tasks become more similar as the child grows older.

Manipulated Expectancies and Teacher Bias
(NICHD, 787-28)

Mr. Cahen

PURPOSE: The purpose of the study is to examine teacher bias and manipulated expectancies and correlates of these behaviors.

PROGRESS: Data are being analyzed to understand further the psychological processes associated with teacher bias or influenceability as conceptualized in the study. Preliminary analyses indicate that the amount of bias contributed to manipulated expectancies has been found to be a function of the amount of information given to a teacher to establish the expectancy. A draft of a Research Bulletin dealing with this analysis has been written. A second analysis will be performed on the data that have been gathered. The second analysis will focus on the personality dimensions of teachers which are associated with the amount of bias displayed in the scoring of pupils' papers. The second analysis will be sequential in nature. It will include separate analyses at different stages of scoring a set of four tests.

Matrix Sampling and Abilities (NICHHD, 787-29)

Mr. Cahen

PURPOSE: The purpose of this research is to study empirical conditions affecting item or matrix sampling. The research will also focus on the mathematical properties of the technique in determining the relationship of the precision of measures to the number of students tested under the technique.

PROGRESS AND MAJOR FINDINGS: A Research Bulletin (68-39) was written containing the results of a large-scale item-sampling administration. A slightly condensed version of this document was published in the Spring 1970 issue of Educational and Psychological Measurement. An additional set of item-sampling data for twelfth grade students has been analyzed and a preliminary draft of this paper is being edited by the authors. The first item-sampling study was done with ninth grade students and the data showed that the method is efficient for estimating school means. The amount of error in the estimation of school means by the item-sampling method is a function of the number of students tested in the sampling unit (schools).

Developmental Changes in Self/World Differentiation
(NICHHD, 787-30)

Mr. Baker

PURPOSE: According to certain leading developmental theorists (e.g., Piaget, Werner, Schachtel), boundaries between self and world are lacking in human infancy and evolve only with higher levels of development. In particular, it is assumed that the relationship between self and world can vary from one of nondifferentiation (i.e., fusion or linkage) which prevails in infancy to one of relative differentiation (i.e., separateness, distance from, or opposite-ness) which characterizes the adult. In a series of interrelated studies, an attempt has been made to demonstrate that even among normal adults, degree of self/world differentiation can vary, and that such variation has measurable effects upon perception. The dependent variable studied in this earlier research was psychophysical error--i.e., anticipation (undershooting) and habituation (overshooting) error--which has long been known to occur in space localization experiments in which some variable stimulus, presented in an ascending or descending trial, is moved to some standard value. The hypothesized relationship between degree of self/world differentiation and psychophysical error which was investigated in these earlier studies can be stated as follows: With less self/world differentiation, the subject tends to "yield" to the pull of stimulus motion in a given direction, thus stopping the stimulus later (= less undershooting or even overshooting); with greater differentiation, the subject "counteracts" the motion, accordingly stopping the stimulus sooner (= greater undershooting). It is now proposed to investigate this hypothesis further by studying age changes in perceptual phenomena, i.e., undershooting and overshooting error in a space localization task, using children between the ages of 7 and 19 as subjects.

PROGRESS: Moderate progress has been achieved to date in the following four areas: (1) Space has been procured for conducting the planned perceptual-cognitive experiments; plans have been completed for adapting this space to the needs of studies which must be carried out under conditions of absolute darkness, and work on these plans is already under way. The equipment needed for the initial phases of this research is now being built. (2) The initial series of studies have been broadly sketched out, and some pertinent literature review accomplished. (3) Data from some published studies by other authors have been procured and analyses are now being undertaken to clarify certain issues pertinent to this project. (4) Reports on two studies completed by the present researcher prior to the initiation of this project, but germane to its broad purposes, have been prepared. One was read at the November, 1969, meeting of the Psychonomic Society in St. Louis (a Research Bulletin is currently in preparation) and the second paper will be read at the APA convention in September 1970. (An ETS Research Bulletin will be available shortly.) Work on an extensive report based on data gathered earlier is now in progress.

Newspaper Tests (ANPAF, 788-1)

Mr. Diederich

PURPOSE: The American Newspaper Publishers Association Foundation sponsors a "Newspaper in the Classroom" program that reaches over 3 million students in grades 7-12 with 68 million copies of newspapers per year. The Foundation sought ETS help in developing tests to measure some of the effects of this program.

PROGRESS: Eight tryout forms of tests based on two simulated newspapers of four pages each, tabloid size, were administered in a spiral order to 4,000 students in 61 schools. Half the students were in newspaper classes, the other half in control classes of equal reading ability without newspaper training. Items on which newspaper classes surpassed control classes were selected for pre- and posttests for junior and senior high schools, published by Cooperative Tests and Services.

MAJOR FINDINGS: Average differences between newspaper and control classes on the 30 items selected for each test were significant at the .01 level. The types of competence revealed by these items were classified in 30 categories that correspond to most of the objectives of newspaper programs and define them more clearly than ever before.

Evanston Integration (795-1)

Mr. Norton
Mrs. Hsia

PURPOSE: In 1967 Evanston School District 65 undertook an integration program which involved redistricting and busing to attain its goals. A longitudinal follow-up of achievement and attitudinal outcomes of the integration effort was undertaken before the beginning of the 1967-68 school year. The longitudinal assessment of outcomes is the purpose of the project.

PROGRESS: Three years of achievement data have been collected; a third year of attitude data are being accumulated. A fourth year of testing has been projected.

International Study of Educational Attainment in
French as a Foreign Language (USOE through Teachers
College, Columbia University, 798-19)

Mr. Carroll

PURPOSE: This is a part of the International Study of Educational Attainment (I.E.A.) being conducted by an International Council headed by Professor Torsten Husén of the University of Stockholm, and in which achievement tests in English as a Foreign Language, French as a Foreign Language, Civics, Literature, Reading Comprehension, and Science will be administered in a number of countries for the purpose of comparative studies. The French as a Foreign Language tests are being monitored by an international committee of which Mr. Carroll is chairman and Mr. Clark is a member. Tests of listening, speaking, reading, and writing are to be prepared for various levels of achievement, ranging from that of a 10-year-old population to that of the pre-university level. Final testing will take place in 1971, followed by extensive data analyses. Data from country, school, teacher, and pupil questionnaires will be correlated with test scores.

PROGRESS: As a result of comments on the semi-final forms of the tests that had been prepared at the meeting of the International Committee in Belgium in June 1969, as well as further pretesting of some of the tests done in England, final forms of the tests were submitted to the International Council at its meeting in December 1969. A series of questionnaires for pupils, teachers, and schools was also prepared. Statistical analysis of speaking test results produced a system for scoring them that would optimally predict global ratings of performance.

U. S. National Testing in French as a Foreign Language
(USOE through Teachers College, Columbia University, 798-20)

Mr. Carroll

PURPOSE: This project comprises all work connected with Project 798, Job 19 that concerns the pretesting and eventual final administration of tests for French as a Foreign Language in the U. S. The work is monitored by a National Committee on French as a Foreign Language.

PROGRESS: No work was done, or required to be done, under this project during 1969-70 since all pretesting was done in countries other than the U.S.

Recall of Approximations to English
(799-2)

Mr. Fremer

PURPOSE: The relationship between age, mastery of formal language, and recall is studied using various approximations to English (AEs), that is, lists of words whose structure and content may be viewed as falling between that of randomly ordered word lists and connected prose.

PROGRESS: Multiple-choice recognition tests were prepared for measuring amount of recall of AEs that had been previously developed as part of this project. The recognition tests were pretested in January and February 1969. Final tests were administered in May and June 1969 to deaf and to hearing subjects at the elementary and secondary school levels. Data analysis has been completed and a report is being prepared.

A Study of the Interrelationships among Reading Comprehension Ability, Writing Ability, and the Linguistic Structure of the Written Language of Sixth-Grade Children (799-9)

Mrs. Massad

PURPOSE: The purpose of this investigation is to determine if significant interrelationships can be shown to exist between the written language ability and the reading comprehension ability of sixth-grade pupils. In so doing selected receptive and expressive language functions are being examined in detail through a reading comprehension test, an objective test for writing ability and an analysis of the linguistic structure of children's written language as expressed in free essay. As a pupil's ability to read and write is an indication of the most noticeable effects of language instruction provided by the schools, an understanding of the interrelationships between the abilities to read and write could provide educators with guidelines for instruction.

PROGRESS: One hundred eighty sixth-grade children were tested in May of 1968. The STEP Reading and Writing Tests and a free essay were the data-gathering instruments used. All scoring for the computerized data analyses has been completed. A more extensive analysis of the linguistic structure of the children's language as expressed in the free essay is still in progress. Results of this more extensive analysis were not included in the computerized data analyses due to a very high level of interdependence among the factors being studied. A factor analysis of the variables indicated that the instruments involved measure (a) reading comprehension ability, (b) ability to use conventions of language--such as rules of grammar and organization patterns, (c) ability to select appropriate language, and (d) two aspects of the linguistic structure of freely written language--the number of communication units and the number of words per communication unit. Of particular interest is the finding that these two aspects of the children's freely written language are not significantly related to the children's reading comprehension ability nor to the children's ability to use the conventions of language to express themselves. (This study is being done in collaboration with Mr. Kender of Lehigh University.)

PURPOSE: The current project is directed toward an analysis of the item writing process and the development of computer techniques for item generation. Systematic exploration of the item writing process may make possible the generation of test items with prespecified properties which would require only minor editing before preliminary testing. The main objectives of the project involve the identification of the properties of words and sentences which are most relevant and essential to the creation of test items and the development of rules for the coding of words and sentences so that they can be manipulated by a computer.

PROGRESS: The initial exploratory studies focused on items involving single words, e.g., spelling item types. Those studies involved a systematic analysis of frequently occurring misspellings and the development of a set of error-generation rules in the form of a computer program. A paper describing the initial phase of the research and the logic of the computer program has been published in the Journal of Educational Measurement, 1969, 6.

More recently, a second set of studies was undertaken. They involved the application of a syntactic analysis to sentence completion items in order to identify techniques which might be used in the preparation of those item types. In order to write a "good" sentence completion item, one must first find an appropriate sentence. Preliminary inspection of a subset of "good" sentence completion items, e.g., items with acceptable pretest statistics, revealed the existence of considerable syntactic similarity. Therefore, a structural analysis of these items was performed in order to identify particular structures or other descriptive or enumerative features unique to "good" items which might lead to sentence selection rules. Subsequently, an objective set of selection rules was developed. The rules could be applied by a computer to appropriately classified textual material and used to identify some subset of the total range of sentences now used as sentence completion items. A paper describing this research is available as TDM-69-1.

Current plans call for the development of a facet-type model of relationships employed in analogy items, and an attempt to develop entirely new item types more appropriate than existing types for generation by computer and for testing in the interactive mode.

Academic Credit by Examination
(CEEb-CASE, 839-1)

Mr. Sharon

PURPOSE: The focus of this study is on the nontraditional student who has obtained part of his education outside of a formal school system and who was admitted to a college or received college credit on the basis of the Tests of General Educational Development (GED) or the College-Level Examinations (CLEP). In addition to determining the validity of the two test batteries for predicting the college success of the nontraditional student, the problems and satisfactions of these candidates and their impact on the college will be assessed. A variety of assessment techniques, including tests, questionnaires, and interviews are being employed.

PROGRESS: Sixteen colleges and universities have provided data on about 500 GED students. Interviews with a small number of GED students were conducted on the campuses of four institutions. The CLEP part of the study, however, was temporarily cancelled because sufficient data could not be obtained. It was decided to continue with the GED part of the study according to the original schedule and to explore the possibility of conducting the CLEP part only at two or three universities which have large numbers of CLEP students.

System of Interactive Guidance and Information
(Carnegie, 842-2)

Mr. Katz

PURPOSE: A computer-assisted system of interactive guidance and information is being developed to improve career decision-making in junior colleges.

The model for this system emphasizes control by the individual student. After an introductory "overview" of the entire system, he will be free to proceed at will in four sub-systems: Values, Information, Prediction, and Planning. He will be able periodically to combine elements from these four sub-systems to rank various options in a way that combines subjective utility and objective probability. This ranking can be regarded as a formulation of hypotheses to be put to reality tests and then confirmed or revised. In this way, the student can progressively master strategies for career decision-making that are designed to enhance informed and rational behavior in the face of uncertainty.

PROGRESS: The "overview" script was written (PR-70-4), a student terminal was designed and built, and a demonstration was programmed and set up. This demonstration, using parts of the "overview" script, allowed subjects to interact with the system. The script-writing, terminal development, and programming have now gone through an iterative procedure, with each component being successively improved, refined, and articulated with the others.

Assessment and Development of Cognitive
Skills in Young Children (Carnegie, 858-1)

Mr. Chittenden
Mr. Bracey
Mrs. Bussis
Mrs. Tanaka
Mrs. Orost

PURPOSE: This project was initiated in the Spring of 1966 in collaboration with the New York City School System. The goals of the project were the development of practical measurement systems for monitoring the cognitive development of four- and five-year-old children and research on strategies for fostering such development. The project grew out of work done at the first-grade level during 1964 and 1965 which resulted in the preparation of a teacher's guide, Let's Look at First Graders, a series of written exercises, some instructional and assessment tasks, and a manual describing the use of these tasks.

PROGRESS: During the 1966-67 school year data were collected for a study of cognitive development in four areas--classification skills, time concepts, transformations (the understanding of change), and language. A total of 259 New York City children, representing both middle- and lower-class neighborhoods and spaced in three-month age intervals from four years three months to six years, were tested with seven experimental assessment tasks and the Peabody Picture Vocabulary Test. The same sample was tested a second time three months later so that a limited longitudinal picture of growth could be obtained. During the school year 1967-68 two studies were conducted to evaluate methods of fostering cognitive growth, one in the area of classification skills and one in the area of number conservation.

MAJOR FINDINGS: Even at this early age, there is clearly a greater discrepancy in cognitive performance between SES groups than between age groups. No evidence of significant sex differences was found. The process of constructing sound measure in cognitive areas for children of this age requires cycles of tryout and revision to insure that instructions are clearly understood by the children and that tasks of appropriate difficulty are used. The results of instructional studies on conservation of number and classification indicated that these skills could be taught to both lower- and middle-class kindergarten children. There is some evidence that impulse control becomes a crucial factor when there is a systematic effort to teach classification skills.

Development of Procedures for Assessing
Open Education in Follow Through Programs
(OE, 858-50)

Mr. Chittenden
Mrs. Amarel
Mrs. Bussis
Mrs. Tanaka

PURPOSE: The first purpose is to state the basic objectives of open education (as represented by the Education Development Center Follow Through Program) in a form which provides a framework for evaluation. The second purpose is to begin the development of assessment procedures which are appropriate to such an educational position.

PROGRESS: Observations were made throughout the year of EDC Follow Through classrooms in several different states. Interviews with EDC advisory staff have been completed, and certain new measures have been given preliminary trials with kindergarten and first-grade subjects.

MAJOR FINDINGS: A final report is near completion. The report contains (1) our activities of the past year, (2) analytic conceptualization of open education, (3) field impressions, (4) description of preliminary work on measures, and (5) implications for research and evaluation.

Number Conservation (865-9)

Mrs. Orost

PURPOSE: The purpose of the project was to assess the durability and generalizability of training in number conservation. Children trained in number conservation in the spring of 1968 (Rothenberg and Orost, RB-68-49) received six and 12 months posttests. In addition, achievement in first-grade mathematics was assessed in the fall and spring, comparing "natural" versus trained conservers and conservers versus nonconservers.

PROGRESS: Fall and spring administration of the conservation task (individually administered) and the Cooperative Primary Mathematics Test, plus December teacher ratings of math achievement have been completed. Analysis of data has been completed and a Research Bulletin is in preparation.

MAJOR FINDINGS: Trained conservers maintained this skill for the 6 and 12 months' posttests. There was no significant difference in math scores between trained and "natural" conservers.

Conservers scored significantly higher than nonconservers on both fall and spring administrations of the math test. Point biserial correlations between conservation and math scores ranged from .607 to .943.

Rank order correlations between teacher ratings and test scores on mathematics were very low in the lower class schools (ranging from -.43 to .44), but were much higher in the middle class schools (.51 to .89). Observations plus scrutiny of the test data revealed some interesting differential effects of teaching style on test performance of pupils at different ability levels.

Teacher Behavior Research--General (868-3)

Mr. Medley

PURPOSE: Development and improvement of objective instruments for measuring classroom behavior.

PROGRESS: A prepublication draft of a manual of instructions and a temporary SCRIBE form for recording verbal behaviors in the classroom (Observation Schedule and Record, Form 5V, or OScAR 5V) has been completed and given extensive distribution for comments and reactions before final publication. A computer program has been written which calculates frequencies of each of the 68 different kinds of events recognized in the system. Scoring keys are being developed on the basis of a factor analysis of data collected with an earlier form.

Memory System in Young Children
(858-30)

Mr. Bracey

PURPOSE: The area of memory, which has been a prime focus of many researchers has been neglected by developmental psychologists except for the area of short-term memory. The purpose of this project is to extend some of the findings and techniques of research with adults to that of young children. Areas to be investigated include long-term memory, memory scanning, rate of forgetting and the organization of memory.

PROGRESS: A number of 3- and 4-year-old children have been tested on rate of forgetting and on organization of memory. Instrumentation difficulties have prevented a successful test of long-term recall. Work is in progress to remove these difficulties.

Long-term recall technical difficulties are still unsolved for youngest children. A full scale experiment covering ages 4-6 has been conducted. A relevant redundant cue concept acquisition task was included to provide additional information on acquisition rate, attention deployment and effects of short term memory or concept acquisition.

MAJOR FINDINGS: Although data are not yet fully analyzed because of lack of funds, the following generalizations seem warranted: (1) Short-term memory improves, but not dramatically over the age range. (2) The rate of forgetting is very rapid at all three ages. (3) Long term memory shows a complex and not easily understandable relationship with age. (4) There is no relationship between short- or long-term memory and concept acquisition as measured with the instruments of this experiment. The lack of relationship may be attributable to the small variance of the memory scores. (5) On the relevant redundant cue concept acquisition task, there is no evidence that most children at any of the ages are actually learning a concept; transfer scores are essentially zero. (6) Since transfer scores are essential to discussions of attention deployment, no inferences about attentional processes can be made at this time. (7) With increasing age, there is a drop in the number of trials to criterion on the concept acquisition task, but no corresponding change in time to criterion. This suggests different cognitive processes at different ages during a single "trial." It also suggests that paced and semi-paced tasks (as in the present study) may yield different results.

A Study of Intellectual Growth and Vocational Development (USOE, 870, All Jobs)

Mr. Hilton
Mrs. Casserly
Mr. Evans
Mr. Freeberg
Mr. Godwin
Mr. Katz
Mr. Patton
Mr. Rock
Mr. Rosenfeld
Mr. Warren

PURPOSE: The objectives of the study are: (1) to trace the intellectual development of students who subsequently elect vocational as opposed to college preparatory curricula; (2) to investigate the interaction over time of stated vocational plans, individual characteristics, environmental influences, and subsequent occupation; (3) to develop a preliminary theoretical model of vocational development.

PROGRESS: The work is being conducted as a series of separate but related studies. Job 10, the Vocational Decision-Making Study, involves the construction and pretesting of a structured interview schedule to collect data on vocational decision-making. The data include individuals' perceptions of occupational values, strategies for seeking and processing information, and rationale for present occupational position or plans. A description of the interview schedule is contained in RM-69-3.

Job 11, the Curriculum Group Achievement Study, involves a multivariate analysis of variance of the antecedents and achievement of students enrolled in various high school curricula. The dimensions of the design are school, curriculum, sex, and socioeconomic status. RB-69-29 reports the results of this study.

In Job 12, Simulation of Curriculum Assignment Process, steps are being taken towards a computer simulation of the process by means of which high school students become associated with a particular academic curriculum.

In Job 13, the Follow-Up Study, follow-up questionnaires were sent to graduates of Growth Study schools. Analysis included grouping the subjects by sex, high school curriculum, and current activity; observing the relationship between curriculum and current activity; and then comparing the pattern of activities since high school and plans for the future across the various groups. For one or two Growth Study school systems post-high school activities in relation to race and perhaps social class will also be observed.

The purpose of Job 14, the School Setting Study, is to assess by means of interviews the "climate" of the Growth Study schools and the communities in which they are located in order to gain data to explain observed differences in test performance, dropouts, and curriculum enrollments in the various Growth Study schools. Staff members visited most of the Growth Study schools to conduct interviews with counselors, teachers, and students, using an interview schedule developed for this purpose.

Job 15, the Biographical Factor Stability Study, involves the analysis of the responses to the Background and Experience Questionnaire, which was administered to the total Growth Study sample in 1963, 1965, and 1967, to determine the factor stability over time of the responses and changes in validity of the factor scores based upon STEP scores as criteria.

For Job 16, Moderated Prediction within Curriculum, approximately 900 students from one Growth Study school system having complete information on aptitude tests, background questionnaire, curriculum grouping and criterion information were selected for extensive analysis in an attempt to define and describe those measurable characteristics of an individual which may interact with his achievement and his curriculum. RB-69-32 describes the results of this study.

The Dropout Study, Job 17, is an investigation of the pattern of early academic achievement, background, and academic growth as it relates to school persistence. The first phase of this study focused on one large Growth Study school system which has participated in the Growth Study since 1961. In the second phase the study was repeated in a second school system. A Research Bulletin is in preparation.

The purposes of Job 18, Negro-White Differences, were (1) to investigate the intellectual growth patterns of Negro and white students as reflected by their scores on SCAT and STEP at four different points in time (grades 5, 7, 9, and 11) and (2) to utilize the Background and Experience Questionnaire and information on curriculum enrolled in to describe the cultural patterns associated with the differences. Racial data were collected from the two largest Growth Study school systems and were put on the data tape. RB-69-71 describes the results.

MAJOR FINDINGS: Cutting across all the studies are the following generalizations:

1. Each of the multivariate analyses of variance and the on-site school studies point to one major generalization, mainly, that one cannot generalize across schools. Although there are general trends and overall differences, each school is unique--in the structure and organization of its programs, in the performance of its students within each curriculum, in the performance of students grouped by race, or by sex within each curriculum.

2. In all the studies it has been necessary to recognize the strong and pervasive relationship of each student's family status to his choice of curriculum and to his performance within that curriculum. To understand school effects, curriculum effects, and racial effects, it is essential to understand the precise nature of the impact of family status.

3. Large scale multivariate analytical techniques, although powerful, must be supplemented with other data collection and analytical methods. These techniques serve largely as methods of data reduction and to identify significant differences and interactions. Explaining the differences and interactions requires further analysis and, often, additional data collection, sometimes from field studies and observation at a clinical level.

Test and Job Performance of Various Subgroups within
Specified Occupations (Ford Foundation, 879, Jobs 2 & 3)

Mr. Campbell
Mrs. Crooks
Mr. Pike
Mr. Rock

PURPOSE: This project seeks to investigate the relationship between job and test performance for different ethnic groups when pertinent background factors are taken into consideration.

The study grew out of a concern by the U. S. Civil Service Commission regarding the impact of tests on the selection and advancement of minority group members. The objective of this study is to identify tests which are good predictors of job performance and at the same time do not place certain cultural subgroups at an unfair disadvantage. The project is being carried out under a grant from the Ford Foundation as a joint responsibility of ETS and the U. S. Civil Service Commission.

PROGRESS: The first job studied was that of Medical Technician in Veterans Administration hospitals which was reported in the 1968-69 summary.

Work is now under way on a second job, cartographic technician in the U. S. Army Topographic Command and the U. S. Coast and Geodetic Survey. Thirteen aptitude tests which appeared to measure abilities related to cartographic work were selected. These and a personal history questionnaire were administered to approximately 500 technicians at four Topographic Command installations, and to 100 technicians at one Coast and Geodetic Survey installation. Rating scales on eight dimensions were specially developed for the project, and completed by two or more supervisors for each technician. In addition, a job knowledge test and three work sample problems were administered at the Topographic Command installations.

Test scoring is under way on these data, and data analysis will begin shortly.

Work will also be undertaken shortly on a third occupation, Inventory Management Specialist in the Defense Supply Agency and the Departments of the Army, Navy, and Air Force.

Exploratory Project on Adaptive Programming (880-3)

Mr. Anastasio

PURPOSE: A major goal of research on adaptive programming techniques is to construct systems, usually computer programs, which enable a computer to "behave" in ways that most people would agree seem to show intelligence. The current project was designed to provide the opportunity to become familiar with and proficient in the development and application of computer techniques for the processing of nonnumerical data. A single topic (the game of GO) has been selected as a creative exercise in programming a complex system. GO has been chosen because it represents a point midway on the continuum from the relatively precise, well-defined, mathematical domain to the relatively imprecise, sometimes ambiguous, psychological domain. As an interactive process and as a game of strategy, it represents a complex problem task with simple rules, the study of which may provide a valuable bridge to applications of adaptive programming techniques in other areas.

PROGRESS: The majority of the effort to date has been expended on the development of a conceptual scheme for describing the game of GO in terms which readily and efficiently lend themselves to computer implementation and on the preparation of a complete, though presently primitive, game-playing program on the PDP-8 computer. The major conceptual problem has involved identifying vital perceptual characteristics of the game board and incorporating information about the formations and positions into the selection logic of the program.

In addition to initial efforts with the GO program, two additional demonstration programs have been developed. The first, a version of the game NIM, is an interactive program which, like the GO program, operates in a competitive fashion against a human. An additional characteristic of the NIM program, however, is that the computer's "playing ability" can be adjusted to any one of nine levels, thereby providing a "better match" for the skills of any given individual. The second is a hypothesis testing program which demonstrates how the computer can be used in a cooperative, rather than competitive, fashion as an aid in interactive problem solving. The hypothesis testing program seeks a solution to a problem by first extracting information about the environment and then, through the use of deductive inference, generating new hypotheses about the solution.

Experience with the programs has provided valuable insights regarding adaptive programming techniques. In particular, it has become apparent that a central characteristic of adaptive programming, if not its key requirement, is the process of translating human rational and perceptual thought processes into algorithmic and heuristic form readily compatible with the nature of computer processing. A paper describing this research is currently in preparation.

Institutional Vitality Study
(Kettering Foundation, 882-1)

Mr. Peterson

PURPOSE: The original objective of this project was to develop a multidimensional measure of "institutional vitality" as perceived by various segments of the college community, e.g., faculty, students, administrators, governing board members. The study was supported by a Kettering Foundation grant to the Institute of Higher Education at Columbia Teachers College, which subcontracted the instrumentation project to ETS.

PROGRESS: Developmental work has been completed. Comprised of eleven 12-item scales, the Institutional Functioning Inventory is available on a limited basis to college researchers through ETS's Institutional Research Program for Higher Education. A technical manual has been written, and should be available in August of 1970.

Research Bulletin 69-77 presents an attempt to predict various kinds of student protest by means of the IFI variables in a sample of 50 colleges.

Trustee Study (882-21)

Mr. Hartnett

PURPOSE: Evolving from the research interests of Morton Rauh of Antioch College, this study consisted of a survey of approximately 9,000 members of college and university governing boards. Including trustees from a diverse range of institutions of higher education (e.g., public and private universities and colleges, junior colleges, etc.), data were gathered regarding board members' backgrounds, educational attitudes or "philosophy," and the nature of their responsibilities and actions as trustees.

PROGRESS: The project has been completed and a summary report written (College and University Trustees; Their Backgrounds, Roles, and Educational Attitudes). Reports of further analyses of these data are planned.

Trustee Study #2 (882-22)

Mr. Hartnett

PURPOSE: To extend our understanding of college and university trustees and trusteeships by focusing on the interrelationships among the characteristics described in the first report (882-21), by relating these data to those published in other sources, and by concentrating more carefully on the question of governance.

PROGRESS: The project has been completed and a summary report written (The New College Trustee: Some predictions for the 1970's) which is available for \$2.00 per copy through the Institutional Research Program for Higher Education (IRPHE), Educational Testing Service.

MAJOR FINDINGS: Significant changes have taken place since 1968 in the composition of many college and university governing boards. Members of groups previously not well represented on boards of trustees--Negroes, women, and people under age 40--have been added in considerable numbers to these governing boards. These additions, it is pointed out, will probably tend to have a liberalizing influence on the overall orientations of most governing boards.

Characteristic Study (884-1)

Mr. Rock

Mr. Centra

PURPOSE: The major purpose of this research was to attempt to find partial answers to two basic questions: (1) If the input with respect to student ability is held constant, will identifiable groups of colleges have graduates showing greater gain in achievement than others, and (2) Contingent on demonstrating differential gains between colleges, what are the characteristics of the most and least effective schools?

PROGRESS: Analysis has been completed for 84 colleges participating in the Study of College Characteristics as a moderating influence on student achievement. Between colleges variance in input was measured by appropriate SAT scores while between colleges variance in output was measured by appropriate GRE area scores. A report (RB-69-27) is published and appears in the American Educational Research Journal, 1970, 70(1), 109-121.

MAJOR FINDINGS: The analyses suggest that 85% to 90% of the variance among colleges was predictable from the student input. Of the 10% to 15% remaining variances among colleges, a small but significant portion was predictable from income per student, the proportion of faculty with a doctorate, and the interaction of these two variables.